CHAPTER II

CHALLENGES TO MARITIME SECURITY
CHALLENGES TO MARITIME SECURITY

A. FORCES AFFECTING MARITIME SECURITY

A variety of factors, many beyond the scope of the maritime arena, will have a substantial effect on maritime security through 2020. Most will be neither inherently stabilizing or destabilizing, but will encompass elements of each. These forces are already at work today; indeed, many profoundly affect the maritime security environment. By 2020, some will retain their prominence, and others will rise markedly in influence. Among these forces, of primary importance in 2020 will be global economic change, international migration, the growing importance of non-state actors, technological development, and the emergence of information operations.

1. Economics

The global economy will be one of the primary forces affecting activity in the international maritime environment through the year 2020. There are several enduring macro-economic trends that virtually all economic forecasters agree will characterize the international economic environment of the 21st century. These trends are growing international trade, global economic growth, and macro-stability/micro-instability.

Although international trade has grown for many years and most experts believe that it will continue to grow in the long term, a debate exists as to the direction that growing trade will take. The debate is characterized by three main views:

> *Globalization.* This view holds that increases in international trade prove that global economic integration is taking place, driven in part by the collapse of the Soviet Union and Warsaw Pact and the resulting spread of free-market capitalism among the Soviet successor countries, in Eastern Europe, and among former Soviet client states elsewhere. Such integration is forcing economies around the world to depend more upon one another. According to this view, the World Trade Organization (WTO) and the General Agreement on Trade and Tariffs (GATT) will typify the future international trade environment. [1]

> *Regionalization.* This view holds that the increase in international trade signals a regionalization of trade. The end of the bipolar Cold War world system has not resulted in a world without poles, but rather with a multipolar world based on regional interests. The North American Free Trade Agreement (NAFTA), European Union (EU), and Association of Southeast Asian Nations (ASEAN) typify the future international trade environment in this view.

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[1] Allen Hammond, Which World? Scenarios for the 21st Century (Washington, D.C.: Island Press, 1997), 30.

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> *Regionalization Leading to Globalization.* In this hybrid view, the creation of regional trade groups and agreements is driving international trade now, but is an intermediate step toward an inevitable globalization of trade. [2]

Many other issues also are debated among experts on international trade. However, general agreement exists that international trade will continue to grow, and this growth is the real long-term trend on which maritime planners should concentrate. For the United States, this growth in trade is shown in Figure II-1.[3]
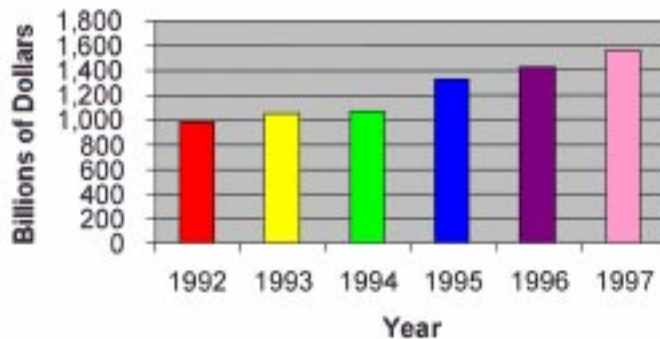

Figure II-1. U.S. International Trade, 1992 to 1997. (Tot exp. + Tot imp.)

The effects of increasing trade on the maritime interests of the United States are many and varied. Approximately 98 percent of this trade is maritime, and at current growth rates, U.S. maritime trade will likely triple by 2020.[4] This tripling of trade will strain the U.S. port and intermodal transportation infrastructure. If the U.S. infrastructure does not keep pace with the increasing volume of trade, bottlenecks will occur or trade may be diverted to other North American ports, especially with the NAFTA agreement facilitating the transshipment of cargoes destined for the United States through Canadian and Mexican ports.

In addition to the infrastructure challenges presented by growing international trade, safety challenges may emerge. A growing volume of cargo traffic will lead to increasing congestion of the nation's waterways, especially the deep-draft waterways capable of handling the largest international vessels. This growing congestion may lead to an increased number of maritime accidents, which in turn would lead to increased U.S. expenditures on Port State Control, law enforcement, and vessel traffic control services.

Since at least the end of the Cold War, the dominant trend in the overall world economy has been growth and stability. In most nations around the world, every measure of material progress has shown an increase. These include measures of the wealth of nations, such as gross national product, and also measures of the wealth of individuals, such as per capita income. The National Intelligence Council's long-term projections forecast a continuation of this trend with real per capita income growing at over 2 percent per

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[2] John Naisbitt and Patricia Aburdene, <u>Megatrends 2000</u> (New York, NY: William Morrow & Co., 1990), 22.

[3] <u>U.S. Exports/Imports History: Historical Summary 1992-1997</u>, CD-ROM. (Washington, D.C.: Bureau of the Census, 1998).

[4] United States Coast Guard, <u>Coast Guard 2020</u> (Washington, D.C.: United States Coast Guard, 1998), 4 and Charles Bookman, "U.S. Seaports: At the Crossroads of the Global Economy," <u>Issues in Science and Technology</u> (Fall 1996): 71.

year.[5] This widespread, long-term growth is attributable to factors such as increased global trade and increased adoption of technology that has continued to raise individual productivity around the world. As this trend continues, global economic growth and stability will bring increasing material wealth to countries around the world.

The path to economic growth, however, is not always smooth, as evidenced by the recent East Asian financial crisis and Russian default. Global economic growth is uneven and not uniformly distributed; this is referred to as macro-stability/micro-instability. From now until 2020, while it is predicted that the world economy will grow overall, there undoubtedly will be individual countries, and individual groups within countries, that will suffer significant setbacks. In fact, there is growing evidence that the economic rift between the developed nations and the developing nations is widening. This potentially growing inequity undoubtedly will lead to tensions and instability.

This dichotomous nature in global economic growth has several implications for U.S. maritime interests. The developed world, with its increasing wealth, will look even more appealing as a destination for citizens of less developed nations. The United States, then, can expect economic pressures to increase immigration from Latin American and Asian countries. In addition, full-blown economic crises that will strike individual countries may trigger political instability, and perhaps a full-scale mass exodus of illegal migrants.

2. Migration

> "In view of the imbalances in demographic trends between "have" and "have-not" societies, it seems unlikely that there will not be great waves of migration in the twenty-first century."[6]
>
> *Paul Kennedy*

International migration, fueled by tremendous population increases in developing countries and uneven global economic growth, will be one of the most important factors affecting maritime security through 2020. This is particularly true for the United States, long a preferred destination for migrants the world over. While it is impossible to predict how many people from individual countries will attempt to migrate to the United States in the 2020 timeframe, many experts agree that the migration issue will be of great concern to U.S. national security. Furthermore, illegal migration via maritime means will be the most visible and problematic. "[M]igrations by boat seem to evoke the greatest perception of threat, and hence the highest political levels of attention."[7]

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[5] National Intelligence Council, Global Trends 2010 (Washington, D.C.: National Intelligence Council, 1997), 2.

[6] Paul Kennedy, Preparing for the Twenty-First Century (New York, NY: 1st Vintage Books Edition, 1993), 44.

[7] Michael S. Teitelbaum, "International Migration as a Pivotal Issue," The Pivotal States, Robert Chase, Emily Hill, and Paul Kennedy, eds. (New York, NY: W. W. Norton & Co., 1999), 273.

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Most of the world's population growth over the next 20 years will be in developing countries. World population will increase from 6 billion in 1999 to 8 billion by 2020,[8] with around 95 percent of that growth in the developing world. The relationship between population growth and its potential to disrupt the international security environment, however, is not simply a function of population increases. Instead, population growth becomes a security concern when the effects of such growth (size, age breakdowns, urbanization, and annual growth rates for example), clash with standing economic resources and political institutions.[9] The huge population increases in many developing countries will overburden their labor markets, public systems, and social services, creating unrest and the incentive for migration.

The movement of people between countries is driven by the interaction of two forces — the negative reality of life at home (often because of political violence, social instability, economic problems, or a combination of these) and the perception that a better life exists elsewhere. International migration spurred by a decline of social welfare or internal political unrest has become more common over the past decades and will continue to drive the movement of many people.[10] As a result, migration, the most natural economic response to population explosions and worsening living conditions in developing states, will remain a major challenge to global stability well into the twenty-first century.[2]

RANK	COUNTRY	POPULATION
1	China	1,246,871,951
2	India	1,000,848,550
3	United States	272,639,608
4	Indonesia	216,108,345
5	Brazil	171,853,126
6	Russia	146,393,569
7	Pakistan	138,123,359
8	Bangladesh	129,798,253
9	Japan	126,182,077
10	Nigeria	113,828,587

Table II-1. Countries Ranked by Population: 1999.[12]

[8] United Nations 1998 Revision of the World Population Estimates and Projections, Population Division: Department of Economic and Social Affairs, "Revision of the World Population Estimates and Projections," accessed online, URL: <http://www.popin.org/pop/1998/>.

[9] Jack A. Goldstone, "Population and Pivotal States," The Pivotal States, Robert Chase, Emily Hill, and Paul Kennedy, eds. (New York, NY: W. W. Norton & Co., 1999), 248.

[10] Patrick M. Cronin, ed., 2015: Power and Progress (Washington, D.C.: National Defense University Press, 1996), 61.

[11] Hamish McRae, The World in 2020 (Boston, MA: Harvard Business School Press, 1994), 116.

[12] U.S. Census Bureau, International Data Base. "Countries ranked by Population: 1999," accessed online,URL: <http://www.census.gov/cgi-bin/ipc/idbrank.pl>.

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RANK	COUNTRY	POPULATION
1	China	1,397,433,520
2	India	1,340,864,767
3	United States	323,051,790
4	Indonesia	276,016,988
5	Brazil	204,186,970
6	Pakistan	198,723,118
7	Nigeria	183,962,179
8	Bangladesh	172,098,472
9	Russia	141,310,968
10	Mexico	134,387,283

Table II-2. Countries Ranked by Population: 2020.[13]

The world of 2020 will see increasing disparities between the haves and the have-nots, not only between the rich and poor in a given country, but also between the developed and developing nations. Latin America, for example, has the highest income disparities in the world; in Brazil, the top fifth of the population has 32 times the income of the bottom fifth. This is only expected to worsen in the future.[14] Income disparities between developed and developing nations are expected to widen as well. In 1995, the average annual income gap per person between developed and developing nations was approximately $18,000. By 2020, that difference will increase to about $30,000 (in 1995 dollars).[15] These inequities in the global economy will be primary incentives for international migration toward developed nations such as the United States.

Due to the factors that draw the poor to the United States, in 2020—as in 1999—there will be more people wanting to migrate to the United States than will be legally permitted. The illegal migration problem will therefore remain, and in all likelihood worsen. Illegal migration to the United States will vary, with Latin America and the Caribbean continuing as the primary source, followed by several Asian nations. Migration in 2020 from particular regions and countries is addressed below.

a. Latin America and the Caribbean

Latin America and the Caribbean, the region with the greatest potential migration impact on the United States, will be the world's second fastest growing region over the

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[13] U.S. Census Bureau, International Data Base. "Countries Ranked by Population: 2020," accessed online, URL: <http://www.census.gov/cgi-bin/ipc/idbrank.pl>.

[14] Allen Hammond, Which World? Scenarios for the 21st Century (Washington, D.C.: Island Press, 1997), 81.

[15] ibid., 80.

next 20 years. By 2020, Latin America's population will be close to 800 million and will constitute close to 10 percent of the global population.[16] While the Latin American economy as a whole also is expected to grow, the distribution of wealth will not be uniform, and the number of poor will increase. The economic and social opportunities available in the United States, its geographic proximity, and the large populations of Latin American and Caribbean natives already living in the United States will continue to make the United States a desirable destination.

The maritime illegal migration of Caribbean people, particularly Cubans, Haitians, and Dominicans, to the United States has been particularly serious over the last 20 years. Illegal migration from these countries over the next two decades will take two forms. First, a rather constant stream of people will arrive in the United States by varied illegal means, most using maritime transit for some part of the trip. Second will be the more dramatic problem of a mass migration from one or more countries by maritime means– a "boatlift"– as has happened several times in the past.

**Figure II-2.
Interdicting Cuban rafters.**

b. Cuba

The future of Cuban migration, like everything else in Cuba, is inextricably linked to the future of the government of Fidel Castro. Cuba, because of its poor economy and political repression, will remain a consistent source of illegal immigrants and a mass migration threat as long as the Castro regime stays in power. At any given time, tens of thousands, if not hundreds of thousands, want to leave Cuba. Castro may allow their departure by boatlift at any time he deems it in his best interest, as he did in 1965, 1980, and 1994.[17]

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[16] United Nations 1998 Revision of the World Population Estimates and Projections, Population Division: Department of Economic and Social Affairs, "World Population Growth from Year 0 to 2050," accessed online, URL: <http://www.popin.org/pop1998/4.htm>.

[17] In October-November 1965, 5000 Cubans departed the port of Camarioca for the United States. From April-September 1980, 125,000 Cubans left via the port of Mariel. In 1994, over 38,000 fled Cuba from various locations along Cuba's north coast, from Havana to Caibarien.

The likelihood of a mass migration from Cuba will be the greatest following Castro's death or at the beginning of the ensuing political transition period. The stability of the Cuban population during this period will hinge greatly on the method of Castro's departure. Two factors in particular will affect Cuban security and therefore the chance of a mass migration. First, at the present time, there is no successor charismatic enough to keep the Communist Party alive once Castro is gone. Consequently, there could be a power struggle or period of instability following his departure, especially if it is a sudden departure. Second, the stated desire by the Cuban émigré community in the United States to be a part of post-Castro Cuba will exacerbate the instability of any regime change.[18] While a mass migration from Cuba will remain a viable threat well into the next decade, the intensity of this threat should decrease by 2020; by that time Cuba should be well past the projected social, economic, and political turmoil of the post-Castro transition period. However, Cuba will likely remain a source of constant illegal migration, akin to the current Dominican migration.

c. Haiti

Illegal migration from Haiti to the United States will encompass two different challenges over the next 20 years. The first is the possibility of a mass migration from Haiti by boat. In the past, political instability and violence have triggered Haiti's mass migrations, and these will likely remain mass migration indicators well into the future. The most recent example was in 1994, when the overthrow of elected President Jean Bertrand Aristide led to the mass exodus of over 25,000 Haitians by boat. The nation's current struggles as a fledgling democracy are just the latest evidence that, politically, nothing seems to change in Haiti. Political instability and ineffective government will probably

Figure II-3. Haitian migrants.

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[18] Hans A. Binnenddijk and Patrick L. Clawson, eds., <u>Strategic Assessment 1997: Flashpoints and Force Structure</u> (Washington, D.C.: National Defense University Press, 1997), 218.

remain over much of the next 20 years, continuing the environment conducive to periodic mass migrations. Furthermore, there is a substantial risk that organized criminal groups, particularly drug traffickers, will become entrenched in Haiti, bringing more corruption and even more instability to the government. There are already signs of this occurring; cocaine smuggling through Haiti has increased over 50 percent between 1996 and 1998, and intelligence reporting indicates cocaine traffickers may have gained influence within government organizations.[19]

The second challenge posed by Haiti is the problem of constant migration brought on by the country's miserable economy. Haiti is likely to remain the poorest nation in the Western Hemisphere, with its wealth concentrated in the hands of very few. The country has few natural resources and has been unable to attract much foreign investment because of its instability. Moreover, Haiti's population is projected to increase from under 6 million in 1990 to close to 10 million in 2020, further straining the already moribund economy.
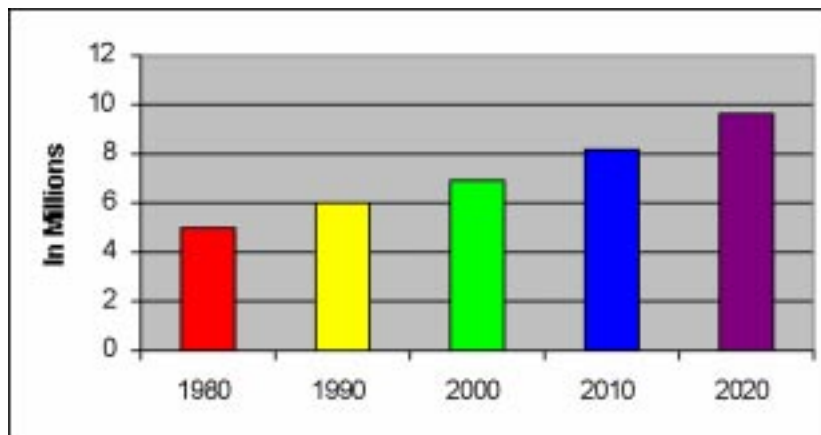

Figure II-4. Population in Haiti.[20]

As they have in the past, Haitians will surely try to escape their plight by attempting to migrate illegally to the United States. Most of these illegal migration attempts will involve large groups of people moving by boat, since most Haitians do not have the means to migrate by more sophisticated methods involving false documentation and air travel.

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[19] Defense Intelligence Agency, Semi-Annual Interagency Assessment of Cocaine Movement, 13th Ed., Classified. DI-2550-138-97, February 1997; Defense Intelligence Agency, Semi-Annual Interagency Assessment of Cocaine Movement, 15th Ed., Classified. DI-2550-141-98, February 1998; and Defense Intelligence Agency, Semi-Annual Interagency Assessment of Cocaine Movement, 16th Ed., Classified. DI-2550-152-98, August 1998.
[20] U.S. Census Bureau, International Data Base. "Haiti, Midyear Population Estimates and Average Annual Period Growth Rates: 1950 to 2050," accessed online, URL: ://www.census.gov/cgi-bin/ipc/idbsum>.

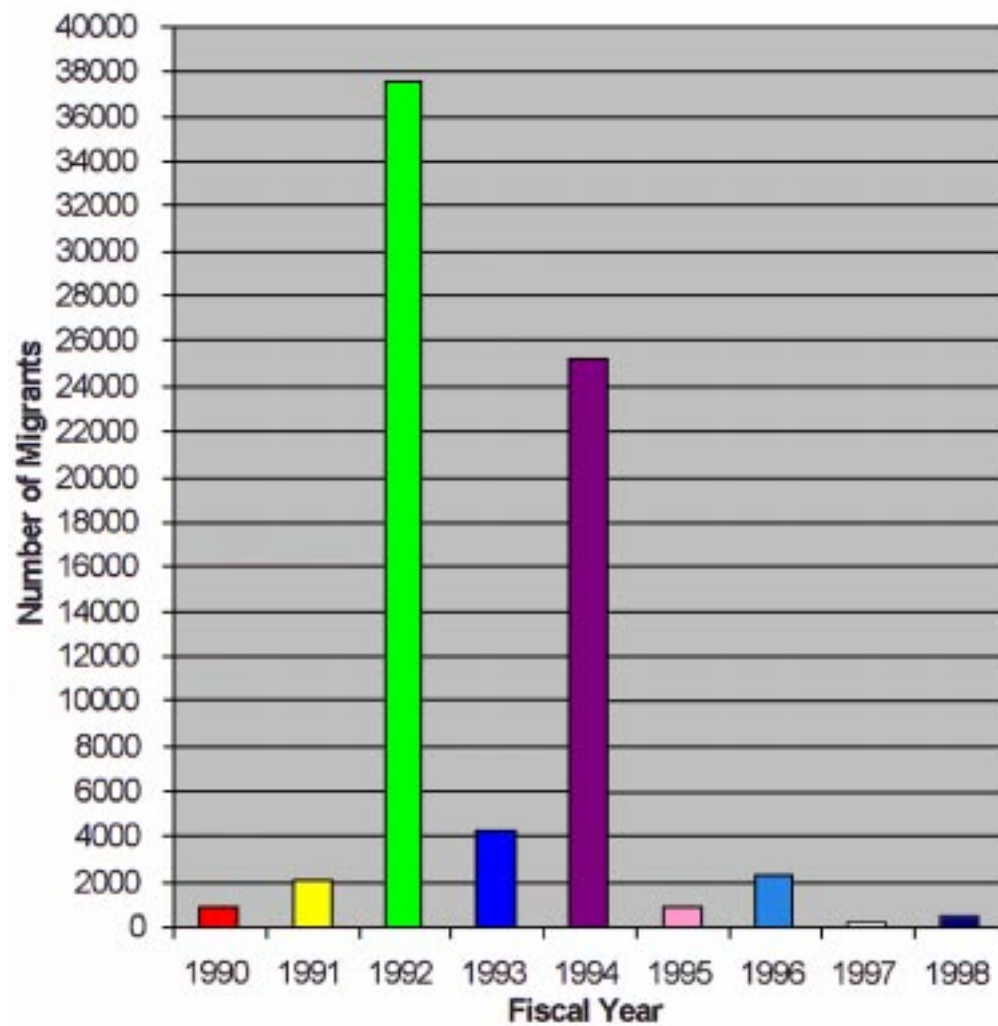**Figure II-5. Haitian Migrants Interdicted at Sea by U.S. Coast Guard, FY90 – FY 98.**

d. Dominican Republic

Migration from the Dominican Republic over the next two decades will take the form of a fairly consistent stream of people moving to the United States either permanently or temporarily for economic reasons. The Dominican economy is more stable and advanced than that of Haiti, but the country's ability to develop beyond a third-world state will be limited by continued internal political corruption and a weak infrastructure. Moreover, between 1990 and 2020, the population in the Dominican Republic is predicted to increase from 7 million to over 11 million people. The combination of a weak economy and a growing population will ensure there is a large pool of people desiring to travel to the United States.
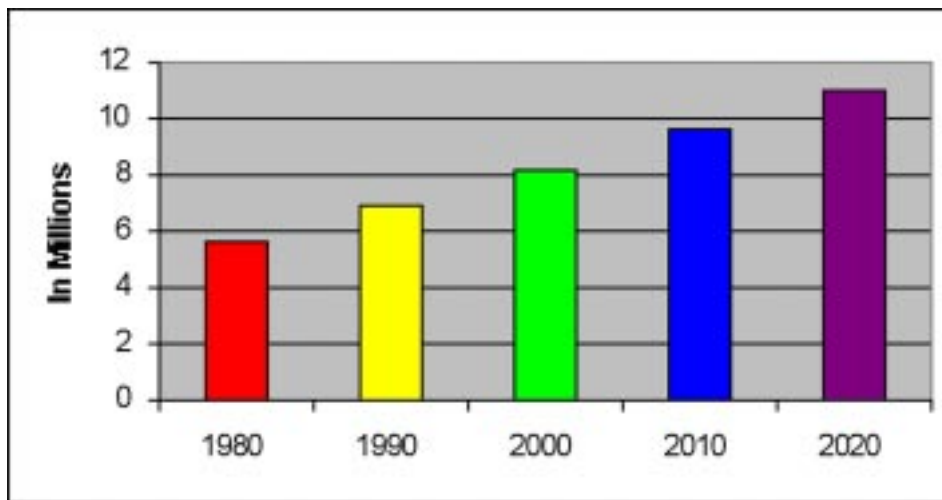

Figure II-6. Population in the Dominican Republic.[21]

Although Dominicans illegally migrate to the United States by various methods, movement by small boat, or yola, to the U.S. territory of Puerto Rico will remain a primary method. The trip across the Mona Passage to Puerto Rico is only about 60 miles, and once there, Dominicans do not have to clear customs and immigration to get to the United States. Sustained law enforcement pressure by both the Dominican and U.S. governments will be able to curtail, but not eliminate, yola transits in the future. Figure II -7 contains historical information on the interdiction of Dominicans at sea by the U.S. Coast Guard.

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[21] U.S. Census Bureau, International Data Base. "Dominican Republic, Midyear Population Estimates and Average Annual Period Growth Rates: 1950 to 2050," accessed online, URL: <http://www.census.gov/cgi-bin/ipc/idbsum>.
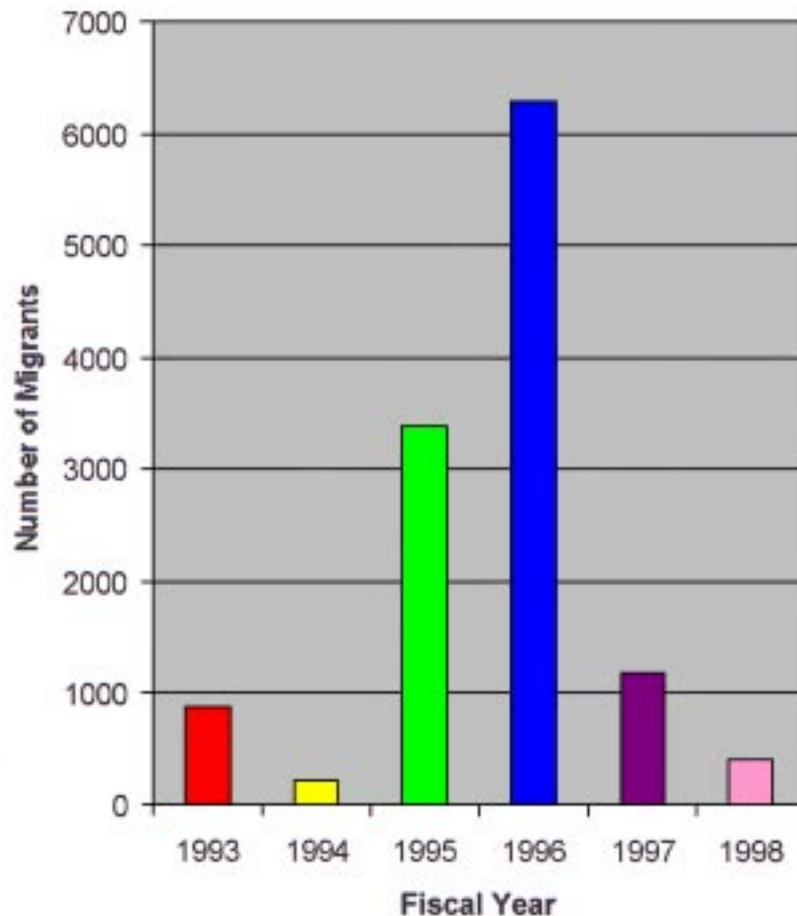
**Figure II-7. Dominican Migrants Interdicted at Sea by
U.S. Coast Guard, FY 90 – FY 98.**

The probability of mass migrations from the Dominican Republic is less than that for Cuba or Haiti, although the possibility will exist through 2020. Political upheaval, violence, or government complicity (as in the case of Cuba) generally trigger mass migrations,[22] but violent rebellion or revolution is not a part of the country's recent history. However, governmental corruption and inefficiency are rampant, factors which eventually could lead to greater instability and an increased risk of mass migration. Also, economic migration will fluctuate, and at times may become pronounced, especially with the economy's inability to cope with the large projected population increase.

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[22] Even the widespread destruction in the Dominican Republic caused by Hurricane Georges in September 1998 failed to instigate a mass migration, further evidence that mass migrations are generally driven by political violence or the fear of political violence.

Figure II-8. Dominican migrants in a yola.

e. Mexico

From the migration perspective, Mexico will present the largest challenge to the United States well into the 21st century. Mexico is the single greatest source of both legal and illegal immigrants to the United States,[23] and serves as the final transit country for many other U.S. bound illegal migrants. Currently, maritime migration from Mexico is low because the vast majority of migrants cross over the Mexican-U.S. land border. However, maritime migration from Mexico may rise in the future if the United States substantially strengthens customs and immigration enforcement on the land border.

Population growth in Mexico, a U.S. labor market in need of Mexican workers, and the established historical pattern of Mexican migration to the United States will ensure legal and illegal migration of Mexicans to the United States remain a constant phenomenon over the next 20 years. It is impossible to count the number of Mexicans who illegally enter the United States from Mexico, but recent estimates project that illegal migration from Mexico accounts for 55 to 60 percent of unauthorized residents within the United States.[24] The Mexican population is estimated to increase from approximately 85 million people in 1990 to over 134 million people by 2020, ensuring there will be strong pressure to migrate to the United States in the future. Furthermore, migration to the United States, either permanent or temporary, has become a way of life for many Mexicans, who can make more money in the United States and even send some of it back to relatives in Mexico.

[23] Michael S. Teitelbaum, "International Migration as a Pivotal Issue," The Pivotal States, Robert Chase, Emily Hill, and Paul Kennedy, eds. (New York, NY: W. W. Norton & Co., 1999), 279.

[24] Peter H. Smith, "Mexico," The Pivotal States, Robert Chase, Emily Hill, and Paul Kennedy, eds. (New York, NY: W. W. Norton & Co., 1999), 232.
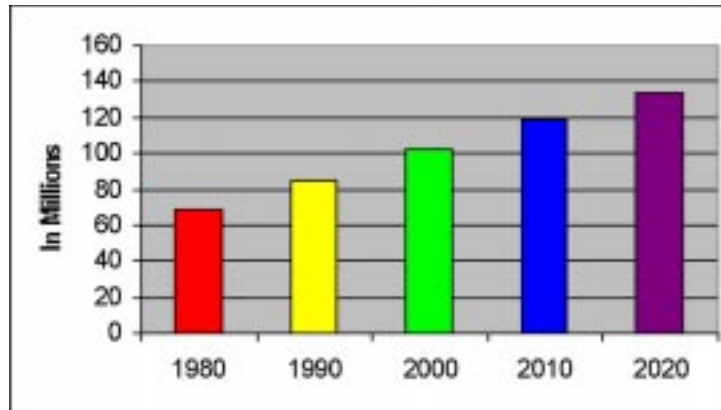
Figure II-9. Population in Mexico.[25]

Mexico is and will remain a key transit country for U.S.-bound illegal migrants from around the world. The country forms a natural land bridge between the United States and the rest of Latin America, and, with its long coastlines, ineffective law enforcement, and a 2,000-mile land border with the United States, Mexico is an optimal migration gateway to the north. Smugglers of Central Americans and Asians, Chinese in particular, will continue to use Mexico as their entry point to the United States. Thousands of Central Americans annually make the trek through Guatemala into Mexico, and into the United States. In the past few years, Chinese smugglers have begun bringing illegal Chinese migrants by boat into Mexico or Central American countries for further transport overland to the United States. There are no indications that any of this will change in the foreseeable future. In fact, the increase in cross-border trade between Mexico and the United States created by NAFTA will only serve to make Mexico more inviting to smugglers of all types of contraband, including humans.

Though illegal migration from Mexico to the United States by maritime means is currently low, it may well increase in the years ahead should the United States substantially stiffen its land border enforcement. There are periodic reports of small vessels skirting around the Tijuana-San Diego border, carrying illegal migrants into California. This type of activity will increase, both on the Pacific and Gulf coasts, should it become more difficult to cross the land border. Because the United States appears committed to raising the priority of enforcement of its southwest border, as evidenced by recent initiatives to substantially increase the number of U.S. Border Patrol agents, much stronger border enforcement is not unrealistic. Smugglers will adapt; if crossing the land border becomes too risky or unprofitable, they will find new means to move their customers. Maritime transport of larger numbers of people by larger vessels is one logical possibility.

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[25] U.S. Census Bureau, International Data Base. "Mexico, Midyear Population Estimates and Average Annual Period Growth Rates: 1950 to 2050," accessed online, URL: <http://www.census.gov/cgi-bin/ipc/idbsum>.

f. Central and South America

As occurs today, many Central and South Americans will attempt to migrate, legally or illegally, to the United States through 2020. The amount of migration will depend on the level of growth of Latin American economies, but, given the anticipated population growth and widening disparity between rich and poor, migration north to the United States will undoubtedly be a desirable option for many. Mass migrations will not likely be a major concern; the challenge of migration from Central and South American states will result from its constancy, not from its peaks.

Because of the success of smuggling illegal migrants overland into the United States, maritime migration will probably not become a great concern. Overland smuggling groups, routes, and methods are well entrenched throughout Central America, and the development of maritime routes and methods is unlikely unless a concerted effort is mounted against overland smuggling. While the United States may mount a stronger effort at its southwest border, there is little prospect for greater enforcement by Central American countries forming the land bridge to the United States. Central American states may make token efforts in response to U.S. pressure, but migrant smuggling is not one of their primary concerns. For most of these states, migration is an important "safety valve" that helps to relieve domestic pressure. Moreover, money sent back to relatives from Latin Americans who have made it to the United States is a significant source of revenue for the economies of these nations. El Salvador estimates that Salvadorans residing in the United States remit $3 billion (U.S.) annually to its economy,[26] equaling between a quarter and a third of its gross domestic product.

g. Asia

The population of Asia will increase significantly over the next 20 years, and population growth in already over-crowded states may trigger an increase in migration abroad, including maritime migration to the United States. Asia's population will grow at a slower rate than Africa and Latin America, but it will still retain half of the world's population in 2020. While this lower rate of population growth will enable some Asian countries to adjust to the effects of demographic change, the projected population growth in countries such as China, India, and Pakistan may introduce or accentuate internal pressures for international migration. The key will be whether economic growth can raise the standard of living in these countries enough to offset the lure of migration to nations such as the United States. Strong economic growth will moderate migration pressures.

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[26] Hans A. Binnenddijk and David C. Gompert, eds., <u>Strategic Assessment 1998: Engaging Power for Peace</u> (Washington, D.C.: National Defense University Press, 1998), 106.

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Over the course of the next 20 years, illegal Asian migration will likely remain a major concern for the United States. Population growth and economic pressures will continue to drive Asians, particularly Chinese, to leave their homelands for the United States. In addition, the expansion of organized alien smuggling operations will provide migrants with multiple channels to the United States.
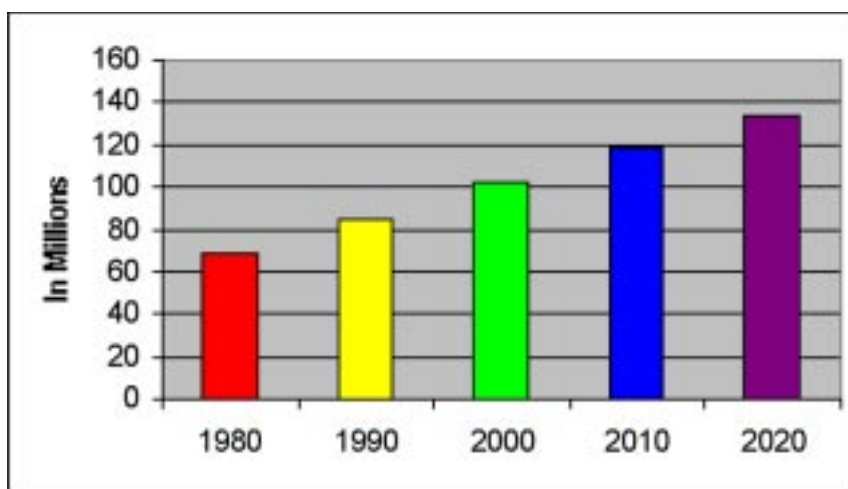
h. China

Illegal migration from the People's Republic of China has intensified over the past decade and is expected to remain a challenge through 2020. This problem is particularly troubling because of its increasing association with organized smugglers and international crime syndicates. These criminal groups actively recruit Chinese nationals, promising safe passage to the United States, in exchange for horrendous fees, inhumane transportation conditions, and possible indentured servitude upon arrival. As the population increases in the People's Republic of China, and as China undergoes the painful, but necessary, reform and restructuring of its economy, potential migrants will continue to use every means available to depart their country illegally, including paying smugglers money to be transported to the United States and enduring a 6-month voyage by sea.

Figure II-10. Chinese migrants interdicted en route to the United States.

Figure II-11. Population in China.[27]

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[27] U.S. Census Bureau, International Data Base. "China, Midyear Population Estimates and Average Annual Period Growth Rates: 1950 to 2050," accessed online, URL: <http://www.census.gov/cgi-bin/ipc/idbsum>.

i. India and Pakistan

The projected population growth in India and Pakistan will increase internal pressures for international migration, including migration to the United States. While the full extent of illegal migration from India and Pakistan to the United States is presently not known, it does occur and typically involves a combination of land, sea, and air travel. It is believed that the majority of illegal entries are made at U.S. airports using false documentation, but Indian and Pakistani nationals also have been stopped in Latin America, the Bahamas, and the Caribbean while trying to enter the United States illegally by maritime means. Maritime transport will be employed in the future by Indians and Pakistanis trying to illegally migrate to the United States, but will likely remain simply one element of a multi-modal voyage from India or Pakistan. Finally, while the future level of illegal migration from India and Pakistan cannot be identified now, the projected population growth in both countries may create the potential for a migratory challenge similar to that currently presented by China.

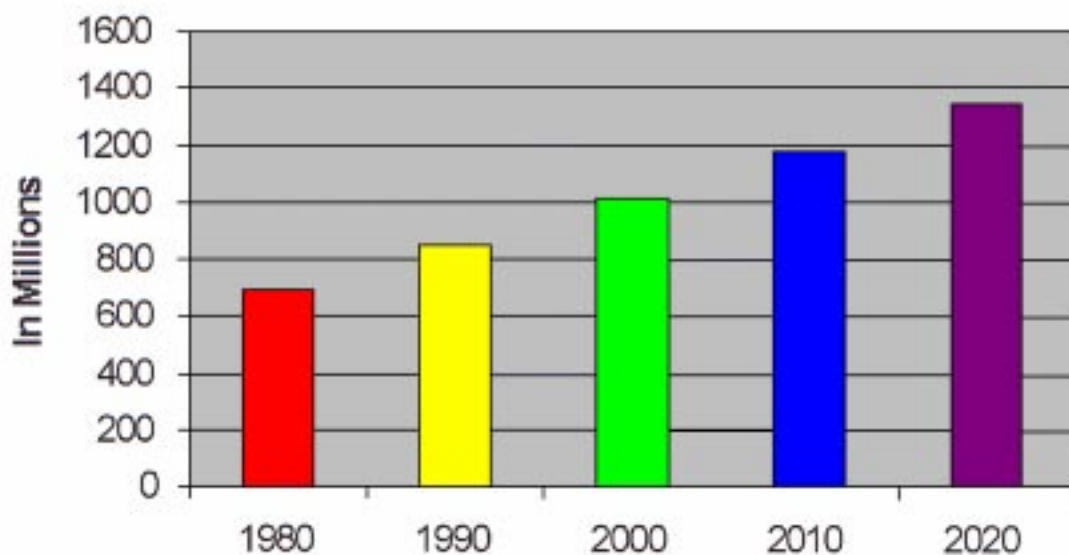**Figure II-12. Population in India.[28]**

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[28] U.S. Census Bureau, International Data Base. "India, Midyear Population Estimates and Average Annual Period Growth Rates: 1950 to 2050," accessed online, URL: <http://www.census.gov/cgi-bin/ipc/idbsum>.
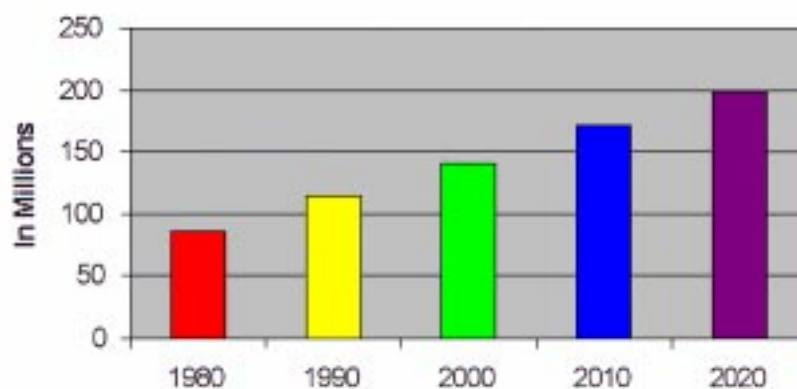
Figure II-13. Population in Pakistan.[29]

j. Africa

Africa, the fastest growing region in the world, will constitute over 15 percent of the world's population by 2010. In particular, Sub-Saharan Africa will undergo the most significant population explosion, with major population increases in Rwanda, Burundi, Ghana, Malawi, Nigeria, and Uganda. However, the migration of large numbers of Africans by maritime means to the United States has not been a significant problem in the past, and is unlikely to become one for the foreseeable future. Between 1992 and 1998, less than 370 illegal African immigrants a year were interdicted by the U.S. Border Patrol at U.S. borders and ports.[30]

Figure II-14. Africa's population will expand significantly by 2020.

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[29] U.S. Census Bureau, International Data Base. "Pakistan, Midyear Population Estimates and Average Annual Period Growth Rates: 1950 to 2050," accessed online, URL: <http://www.census.gov/cgi-bin/ipc/idbsum>.

[30] "Border Patrol Apprehensions by Country of Origin, FY92-98," Office of Intelligence, Immigration and Naturalization Service.

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The maritime movement of Africans, particularly those from the northernmost countries, is generally aimed at the European continent in general and at France and Spain in particular. Over the next two decades, migration is projected to become the single most important issue in relations between the European community and Arab states of Africa.[31] For Africans, Europe is a closer refuge, while there is no historical precedent for major voluntary migrations of Africans to the United States.

Although Africans account for some 48 percent of the world's displaced persons, mass migrations by maritime means to the United States or other countries have not yet occurred and are unlikely to occur in the future.[32] African mass migrations have largely been, and will continue to be, an intra-continental and temporary solution to economic strife, ethnic warfare, or epidemics. Additionally, when such migration occurs, it primarily takes place overland on foot or by vehicle.

3. Non-state Actors

By 2020, non-state actors will challenge the sovereignty of the state and have a greater effect on international affairs. While the state will still play the predominant role in the international political system, national and international security will be affected by the interactions between state and non-state actors, owing to the inclusion of a greater number of players in international affairs and the development of alternative forums for grievances and action.[33]

Non-state actors can be separated into two categories, civil actors and non-civil actors. Civil actors are defined as non-state groups whose actions complement the values of the international community and its state members. Non-civil actors are those groups whose actions defy the values of the international community and its members. Both types of non-state actors pose transnational challenges to individual states insofar as they have the ability to "undermine law and order, and create disaffection and alternate loyalties. Over the long term, they create conditions conducive to instability and conflict."[34] Consequently, the potential exists for non-state actors to decisively affect global conditions by causing governments to lose some measure of control and inhibiting their ability to deliver solutions to their citizens' problems.[35]

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[31] Paul Kennedy, Preparing for the Twenty-First Century (New York, NY: 1st Vintage Books Edition, 1993), 276.

[32] Richard D. Kohout and others, Looking out to 2020: Trends Relevant to the Coast Guard (Alexandria, VA: Center for Naval Analyses, 1997), 21.

[33] ibid., 329.

[34] William Rosenau, Gay Kemper, and David Mussington, "Transnational Threats and U.S. National Security." Low Intensity Conflict and Law Enforcement, 6 (1997): 146.

[35] David Gompert, "National Security in the Information Age." Naval War College Review. Vol. LI, No. 4, Seq. 364. (Autumn 1998): 8.

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a. Civil Actors

The ever-growing importance of civil actors in the international arena is a trend that will continue through 2020. While the objectives of individual civil actors may contradict or challenge the goals of the states in which they operate, the civil actors and the state peaceably work to resolve their differences in the interest of promoting the greater good. The media, multinational corporations, and non-governmental organizations constitute the three major types of non-state civil actors. All three will be able to exert a greater impact on international relations because they have access to resources governments cannot harness and because they often are able to rally international opinion more easily. For example, the media controls what is essentially an extensive intelligence collection capability, and can use the information it gathers to influence its audience and affect policy decisions at the local, national, and international levels. Multinational corporations can have extraordinary influence on local or even national economies, and thereby affect the underlying security of a state. For example, cruise lines, some of which have operating budgets larger than the combined national budgets of several eastern Caribbean states, can greatly affect the economic well-being and thus security of many small states by their decisions on ports of call.[36] Finally, non-governmental organizations can be very effective at advancing their agendas in international forums by mobilizing their constituencies and skillfully pressuring government policymakers, as well as by organizing collective action in response to crises, providing forums for negotiations to mitigate crises, and monitoring post-crisis agreements.

(1) Environmental Activist Groups. One particular type of non-state civil actor that may have great impact in the maritime sphere through 2020 is the environmental activist group. With growing concern about the rising stress on the environment created by population growth and increasing development, environmental groups will likely gain in number and influence. Groups such as Greenpeace already have a large support base of contributors, and carry out operations across the globe.

The marine environment will be of great concern to environmental groups in 2020, with living and non-living marine resource exploitation the primary focus. These groups will not only try to influence public opinion and government policies through media campaigns, but also by taking direct action on the seas, demonstrating against operations they oppose. While most of these demonstrations will be non-violent, the possibility exists for violence to break out when opposing groups come in contact, and conflict in the maritime environment is doubly dangerous for the safety of life and property. Furthermore, some groups may advocate taking aggressive measures to push their causes. There have already been incidents of violence involving environmental activist groups,

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[36] Draft, John Cope, "Western Hemisphere: *Response to Democratic Change*," <u>Strategic Assessment 1999</u> (Washington, D.C.: Institute for National Strategic Studies, National Defense University, 1999), 262.

such as the ramming of whaling vessels by ships belonging to the militant Sea Shepherd Conservation Society.

Future operations by environmental groups will likely increase in complexity and scope. Greenpeace already has a six-ship fleet it uses to carry on its activities worldwide, and in 1998 demonstrated the ability to locate and board a ship on a sensitive mission carrying nuclear waste from France to Japan. Greenpeace also conducted operations in 1998 featuring deception, with their activists posing as security personnel or government inspectors. Success in these operations, particularly if accompanied by media attention, will spur attempts at larger and even more intricate operations aimed at garnering big headlines to further environmentalist causes.

Figure II-15. One of six vessels operated by the environmental group Greanpeace.

An emerging development that may become a source of considerable conflict in 2020 is the diverging interests between environmental groups and native peoples. As native peoples around the world attempt to continue or reestablish customary practices deemed harmful to the environment by activist groups, disagreements and outright hostility may arise. For example, in 1997 the International Whaling Commission (IWC) authorized subsistence hunting of gray whales by the Makah Indian tribe in Washington state and the Chukotka people in Russia. These two peoples claimed that gray whale hunting was a part of their culture; in fact, the Makah cited an 1855 treaty granting its whaling rights. The IWC established a 5-year block quota of 620 gray whales. The plan by the Makah tribe to renew hunting whales is vigorously opposed by environmental groups, especially the Sea Shepherd Conservation Society, which has threatened to disrupt any whale hunt by the Makah. Potential conflicts such as these will likely increase in the future as environmental groups rise in influence and oppose native claims.

b. Non-civil Actors

 Non-state non-civil actors such as organized criminal groups and terrorists will continue to pose a constant challenge to the security of nations and international organizations through 2020. In contrast to civil actors, non-civil actors will not attempt to resolve their differences peacefully within the international system or with individual states. Rather, non-civil actors may use violence or intimidation to oppose the states in which they operate and the international system.

(1) Organized Crime. Organized crime will increase in influence and scope over the next 20 years as organized criminal groups become increasingly entrenched in the international economy and as demand for and profits from the illicit transportation of

people, drugs, and contraband multiply. If left unchecked, international criminal organizations will continue to expand their illegal activities in the 21st century. International criminal organizations will increase in number and influence as they become more adept at manipulating and challenging local and national governments and international organizations and consolidating their power bases.[37] The expected growth of transnational criminal organizations will be exacerbated by advances in communications and transportation technologies; a decrease in governmental controls over the international flow of goods, services, and money; the establishment of international affiliations among immigrant communities; and the projected rates of unemployment in developing countries and in the Soviet successor countries and Eastern Europe. Relying on a myriad of international connections to provide them with both human and financial resources, by 2020 transnational criminal syndicates will be as problematic for global security as organized insurgent groups and terrorists.

According to Dr. Kimberly Thachuk, an organized crime expert,

> "International organized crime is more than simply an extension of domestic crime. It is crime ordered into complex clandestine, hierarchically-organized networks, that operate internationally with little regard for the borders of states. The gravity of the problem lies not only in the increasing complexity of these organizations, but more importantly, with the serious challenge they pose in their ability to penetrate and operate with relative impunity in several states simultaneously. These illegal enterprises not only threaten aspects of state sovereignty and security that have traditionally been taken for granted, but they prove the permeability of national borders and the vulnerability of state institutions."[38]

Criminal organizations will continue to attempt to deceive law enforcement authorities by integrating legal and illegal operations. For example, Chinese triads (organized criminal groups) involved in heroin and maritime alien smuggling set up legitimate businesses in the United States that are used to channel money from their smuggling ventures. Organized crime also will continue to develop business strategies similar to those used by legitimate corporations. The application of these business practices will enable transnational criminal groups to increase the efficiency and profit margins of their operations.[39]

Transnational criminal organizations can not only adversely affect civil society, but they can also threaten the power and sovereignty of the states in which they operate.

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[37] Dr. Kimberley Thachuk, Visiting Fellow, Institute for National Strategic Studies. "International Organized Crime and Drug Trafficking," paper presented at the Transnational Issues Conference, 14-15 October 1998 (Washington, D.C.: National Defense University, 1998), 1.

[38] ibid., 1.

[39] Hans A. Binnenddijk and Patrick L. Clawson, eds., Strategic Assessment 1997: Flashpoints and Force Structure (Washington, D.C.: National Defense University Press, 1997), 201.

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The willingness of transnational criminal organizations "to use force against the state and its law enforcement agencies, challenges the state monopoly on organi[z]ed violence and can be more destabilizing than the activities of revolutionary or terrorist groups."[40] For example, the Russian Mafia has influenced and corrupted national banking systems, commodity markets, and internal security systems, areas that normally fall solely under the purview and authority of the state and its official agents. In Latin America and the Caribbean,

> "The problem of corruption, in which formal political organizations are steadily undermined in their capacity to operate efficiently, cannot be overstated. . . Where organized crime has made a significant inroad, as in Mexico, Colombia, Jamaica, Haiti, and Bolivia, corruption has so undermined legitimacy that these states have at times been unable to guarantee even the most basic order for their citizens."[41]

Over the next 20 years, Russian crime syndicates, Latin and South American drug cartels, and Asian triads and ethnic gangs will continue to vie with one another for regional superiority and the control of illicit activities. All of these criminal organizations possess and will continue to possess the ability to threaten weak states in Eastern Europe, Asia, and Latin America through alliances forged with insurgent groups (e.g., the FARC in Colombia) and by the corruption of police, military, or political authorities.[42]

The end of the Cold War and the opening of Eastern Europe, Russia, and the other Soviet successor countries have brought to light the significant role played by large organized groups in international crime. For example, drug trafficking organizations, seeking to diversify, have extended their connections with criminal groups abroad to expand their operations in both Eastern and Western Europe. The European organized crime groups not only have capitalized on these international connections, but also have seized the market opportunities made available in Eastern Europe and the Soviet successor states by the collapse of the Warsaw Pact and the Soviet Union.

Developing states, Eastern European countries, and the Soviet successor states will be particularly susceptible to the perverse influence of transnational organized crime and will remain susceptible well into the 21st century. Over 8,000 criminal enterprises operate in the 15 countries that succeeded the Soviet Union and at least 200 of those organizations are international in scope.[43] In the absence of effective governments and the

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[40] ibid., 329.

[41] Hans A. Binnenddijk and David C. Gompert, eds., <u>Strategic Assessment 1998: Engaging Power for Peace</u> (Washington, D.C.: National Defense University Press, 1998), 109.

[42] William Rosenau, Gay Kemper, and David Mussington, "Transnational Threats and U.S. National Security," <u>Low Intensity Conflict and Law Enforcement,</u> 6 (1997): 146.

[43] Dr. Kimberley Thachuk, Visiting Fellow, Institute for National Strategic Studies, "International Organized Crime and Drug Trafficking," paper presented at the Transnational Issues Conference, 14-15 October 1998 (Washington, D.C.: National Defense University, 1998), 3.

ability to enforce national and international laws, transnational crime will thrive and could hamper or even cripple the ability of some states to effectively manage their society and even their sovereignty. The growing influence of international organized crime is even felt in developed nations such as the United States. For example, the Chinese triads, which illegally move Chinese nationals to the United States, have almost single-handedly brought the practice of indentured servitude back to the United States.

International organized crime is involved in a wide variety of criminal enterprises, of which the highly visible drug and arms trafficking activities are only a part. Maritime alien smuggling from Asia and the Caribbean to the United States has become a growth industry for large- and small-scale organized criminal groups. Most international organized crime groups are also involved in fraud, cargo theft, the acquisition and sale of precursor chemicals for both drug production and weapons of mass destruction, extortion, etc. The decline in importance of state borders to international business has the negative collateral effect of facilitating the free movement of organized crime operations across national borders and will continue to enable organized crime groups to exert their power globally.

(2) Violent Maritime Crime. Incidents of violent maritime crime will probably not significantly change either in nature or frequency out to and beyond 2020. Consistent with current experience, the vast majority of incidents will occur within port areas, at anchor or in coastal waters. The primary forms of violent maritime crime are piracy and terrorism.

(a) Piracy. While the number of piracy incidents will most likely remain constant over the next 20 years, there will be an increase in incident reporting. It is widely accepted among the government and non-government organizations that track piracy worldwide

(including the U.S. Office of Naval Intelligence (ONI), U.K. Defense Intelligence Service (DIS), Australian Defence Intelligence Organization (DIO) and the International Maritime Bureau (IMB)), that the annual number of piracy cases is seriously undercounted. DIS estimates the actual number of piracy cases could be 2,000 percent higher on an annual basis while DIO estimates the underreporting to be 20 to 70 percent.[44] Since the establishment of the IMB's

Figure II-16. Chinese pirate vessel.

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[44] Defence Intelligence Analysis Staff, <u>Maritime Piracy Today</u>, Classified (London, United Kingdom: Ministry of Defence, 10 July 1998), 1 and Defence Intelligence Organization, <u>Maritime Piracy: Rough seas ahead?</u>, Classified (Canberra, Australia: Department of Defence, October 1996), 3.

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Regional Piracy Center in Malaysia in 1992 and its subsequent efforts to publicize the piracy problem, there has been increased reporting on major incidents (See Figure II-10), but incidents involving fishermen and recreational boaters are still heavily undercounted. Also, the average loss from a piracy incident does not cross the monetary threshold for insurance action, further contributing to underreporting.[45] Most incidents will continue to go unreported except in cases where there is serious loss of property and life or damage to a foreign interest.
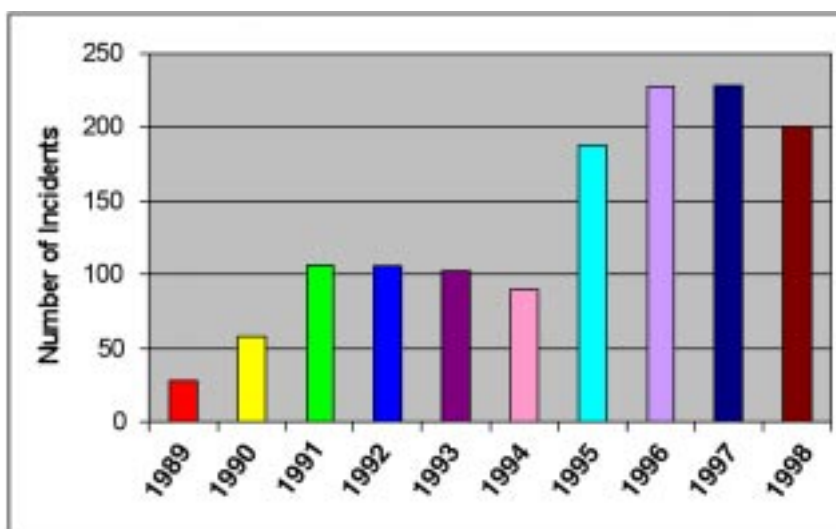

Figure II-17. World Maritime Piracy Incidents.[46]

The concentration of piracy incidents will continue to be located in areas with little or no maritime law enforcement, political and economic stability, and a high volume of commercial activity. Incidents of piracy tend to occur in four regional areas: Southeast Asia, Africa, South America, and Central America (see Table II-3). Furthermore, most incidents of maritime crime occur in coastal waters with nearly 80 percent of all reported piracy incidents occurring in territorial waters (See Table II-4).

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[45] The most common stolen items from piracy incidents are paint and mooring lines as most pirates are analogous to street muggers.

[46] International Maritime Bureau, Piracy and Armed Robbery Against Ships : Annual Report 1st January –31st December 1997 (Essex, United Kingdom: ICC International Maritime Bureau, 1998), 3.

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AREA	TYPICAL TARGETS	CAUSE
Caribbean	Pleasure Craft, Small Merchant Ships	Common Crime, Lack of Government Attention
Central America	Fishing Boats	Common Crime, Lack of Government Attention
South America	Merchant Ships, Fishing Boats	Common Crime, Lack of Government Attention
West Africa	Merchant Ships, Oil Industry	Common Crime, Poor Security Environment
East Africa	Merchant Ships	Traditional Culture, Common Crime, Poor Security Environment
SE Asia	Merchant Ships, Fishing Boats	Organized Crime, Common Crime, Traditional Culture, Poor Security Environment
East Asia	Merchant Ships	Organized Crime, Common Crime, Traditional Culture, Poor Security Environment

Table II-3. Piracy Prone Areas.[47]

GEOGRAPHIC AREA	INCIDENTS AT ANCHORAGES/BERTHS (%)	INCIDENTS WHILE UNDERWAY (%)
Worldwide	79	21
Africa	71	29
Far East	70	30
Americans	95	5

Table II-4. Location of Pirate Victims.[48]

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[47] Information compiled from various reports received and analyzed at Coast Guard Intelligence Coordination Center.
[48] Baltic and International Maritime Council (BIMCO). Newsletter: "Analysis of 1997 Piracy Incidents," 18 February 1998, 3.

Piracy in the 1990s against commercial shipping reveals increasing violence and professional organization. A dangerous trend is the emergence of organized pirate gangs, which may conduct multi-ship operations, and/or use tactics of a quasi-military nature.[49] These gangs may acquire the capability to target ships on the open ocean thus increasing the potential number of piracy victims. Of greater concern to the shipping industry is the level of violence used during attacks. The criminals carrying out pirate attacks often display a complete lack of concern for the victimized crews, who are at risk of being severely wounded, killed, or set adrift.[50] The 1998 hijacking cases of the CHEUNG SON and TENYU in Southeast Asia illustrate the use of violence by pirates. In both cases, the crews were missing and presumed dead (21 total) after the ships were recovered from pirates.

(b) Maritime Terrorism. Future terrorist organizations will continue to use attacks on maritime targets as a means of furthering their political goals. From the 1961 hijacking of the Portuguese flagged passenger vessel SANTA MARIA to the numerous maritime attacks of the Sri Lankan Tamil Sea Tigers during the 1990s, widely publicized incidents of terrorism in the maritime environment have drawn immediate concern and action. There has been a marked tendency when discussing maritime terrorism to

Figure II-18. Law enforcement personnel developing counter-terrorist exercises.

address it as an approaching trend and as a phenomenon somehow different from, and possibly greater than, the broader problem of terrorism. This is particularly true whenever some incident grabs the public attention through extensive media coverage. But analysis

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[49] Samuel P. Menefee, Trends in Maritime Violence (Alexandria, VA: Jane's Information Group, 1996), 1.

[50] Defence Intelligence Analysis Staff, Maritime Piracy Today, Classified (London, United Kingdom: Ministry of Defence, 10 July 1998), 1.

[51] Charles N. Dragonette, "Maritime Terrorism: Underway as Before?," International Perspectives On Maritime Security, Thomas C. Fitzhugh III, ed. (Washington, D.C.: U.S. Department of Transportation, 1997), 159.

of maritime terrorism shows that it is not new and that it differs little, if at all, from terrorism ashore or, for that matter, in the skies. In fact, maritime terrorism occurs in the same forms and methods as acts perpetrated ashore.[51]

Trends seen in terrorism during the late 1980s and 1990s will likely continue in the future. The number of terrorist incidents worldwide has decreased while the number of casualties inflicted has risen. The typical terrorist tactic of holding hostages has declined, due in part to the growing sophistication of counter-terrorist forces worldwide.[52] Also, the number of terrorist groups espousing a leftist ideology such as Marxism and Socialism has decreased, with a subsequent rise in the number of groups based on nationalism, ethnicity and religion.

While terrorists would prefer to attack a target that is immobile and easy to survey, there will continue to be a small number of attacks in the maritime environment.[53] For example, several Middle Eastern terrorist groups maintain a maritime attack capability through diver and underwater warfare training provided by Iran and Libya.[54] Other groups with a cultural maritime heritage find it easier to develop a competent maritime attack capability. The Sri Lankan Tamil Sea Tigers and the Filipino Abu Sayyang Group are examples of seafaring groups that have conducted multiple maritime terrorist attacks, as well as piracy acts for fundraising purposes. The concern for the future is that terrorists will shift emphasis and make the rapidly growing cruise line industry a new target of opportunity.

Major financial loss, significant loss of life, or widespread publicity surrounding environmental damage caused by violent maritime crime will increase pressure upon coastal states to coordinate maritime law enforcement actions. U.S.–Cuba anti-hijacking agreements and anti-pirate agreements between Malaysia, Indonesia, and Singapore may prove to be forerunners of many such accords that will attack the centers of maritime crime.[55] However, international law enforcement coordination will be successful only if it can overcome exaggerated pride, self-sufficiency, and sovereignty concerns of many developing coastal states. Confusion over the proper legal definition of piracy is itself hindering potential international cooperation; the UN definition is concerned with international waters while the shipping industry definition covers all waters (See Text Box). This lack of a common definition slows down the creation of international agreements designed to combat piracy.

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[52] Interview with Jeff Shumaker, Senior Terrorism Analyst at U.S. Department of Transportation, interview with author, 14 January 1999.

[53] Since 1978, the annual number of international terrorist attacks has ranged from 296 to 666 but maritime incidents have averaged around 20.

[54] Open source reporting indicates Lebanese Hezbollah and Popular Front for Liberation of Palestine are conducting maritime training at various sites. References available from Intelligence Coordination Center.

[55] Samuel P. Menefee, Trends in Maritime Violence (Alexandria, VA: Jane's Information Group, 1996), 13.

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VARYING PIRACY DEFINITIONS

INTERNATIONAL MARITIME BUREAU
"Piracy is the act of boarding any vessel with the intent to commit theft or other crime and the capability to use force in the furtherance of the act."

UN LAW OF THE SEA
(1958 & 1982 CONVENTIONS)
"Any illegal acts of violence or detention or any act of depredation committed for private ends by the crew or the passengers of a private ship or a private aircraft and directed:

1. On the high seas against another ship or aircraft or against persons or property onboard such ship or aircraft.
2. Against a ship, aircraft, persons, or property in a place outside the jurisdiction of any state"[56]

The continuance of maritime violent crime will lead to regionalization of anti-crime efforts and the creation or revitalization of foreign maritime law enforcement agencies. In most cases, especially with developing states, this will require major training and equipment infusions from outside sources. Unilateral support to individual coastal states by donor countries without the intervention of a multinational group (IMO, ASEAN, OAS, etc) or non-governmental organization (BIMCO, IMB, etc.) probably will be minimal and will tend to be rejected by the affected coastal states as infringing on sovereignty.[57]

4. Technology

Technology development will be another overarching influence on the maritime environment over the next two decades. Through 2020, advanced and commercial technologies will continue to spread worldwide, enabling state and non-state actors to acquire information and communication systems that will decrease the United States' technological advantage. "From a national security perspective, the most salient trend in the new information environment is that the capabilities DOD [the Department of Defense] spent billions to build in the 1980s are increasingly available for other nations [or non-state actors] to rent or buy at a fraction of that cost."[58] Therefore, while the United

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[56] Hans A. Binnenddijk and Patrick L. Clawson, eds., 1998 Strategic Assessment : Engaging Power for Peace (Washington, D.C.: National Defense University Press, 1998), 106.

[57] IMO is the International Maritime Organization, ASEAN is the Association of South East Asian Nations, OAS is the Organization of American States, BIMCO is the Baltic and International Maritime Council, and IMB is the International Maritime Bureau.

[58] Hans A. Binnenddijk and Patrick L. Clawson, eds., 1995 Strategic Assessment : U.S. Security Challenges in Transition (Washington D.C.: National Defense University Press, 1995), 151.

States will move forward with advancements in power sources, space, electronics and materials, the overall edge that it has enjoyed during much of the 20th century will begin to diminish.

Even though the U.S. technological advantage will decrease by 2020, the United States will remain one of the most technologically advanced states. The American application of existing technological innovations will continue to yield major advancements in defense systems and infrastructure, ensure American technological progress, and reduce the cost of high-end technological products.[59] At the same time, these technological advancements also will produce benefits that can be shared by non-defense industries. For example, the application of technological advancements to the private sector will promote American progress in commercial industry, national economic development, labor efficiency, global production and marketing, creation of a new information infrastructure, and the integration of healthier nations into the core.[60] In fact, even the most advanced militaries around the world increasingly will rely on commercially developed technologies for their highest-technology systems, a reverse of the pattern observed until late in the 20th century, when militaries themselves generally developed the highest technologies. The existence of the highest technology in private, commercial hands before it even is applied to military use will further allow these technologies to find a wide range of non-military applications, and more quickly than in the 20th century.

The hallmark technologies of the 21st century will be power sources (including propulsion equipment and lasers), space satellites and vehicles, electronics (information technologies, communications equipment, and robotics) and design, construction, and composition materials. Emerging technological advancements will include the digitization of all media and data, significant increases in computational capabilities and global interconnectivity on wide band, high-speed networks. There also will be an accelerated global shift to digital, multimedia, and interactive communications and computing.

While the United States will continue to be one of the biggest beneficiaries of future technological advancements and their subsequent applications in the maritime arena, other nations and non-state actors will be able to acquire the same capabilities. Through 2020 and beyond, the operational capabilities of foreign naval forces will increase as more sophisticated weapons and maritime platforms enter service and are made available for international purchase and/or production. Allies and adversaries alike will be able to acquire advanced systems through a variety of avenues, including indigenous and cooperative production, technology transfers, legal arms sales, illegal arms transfers, and the outright purchase and military application of commercially available, "off-the-shelf" civilian technologies. The appearance of high-technology systems world-

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[59] David Gompert, "National Security in the Information Age." Naval War College Review. Vol. LI, No. 4, Seq. 364. (Autumn 1998): 28.

[60] ibid., 27.

wide, as well as their application to every possible contingency–from conventional operations to asymmetric warfare[61] – will ensure that the maritime environment continues to present a challenge to U.S. maritime forces.

a. Platforms

Technological trends for surface ships will include an increase in modular armament and combat systems, decreased radar cross-section, and reduced emitted signatures. In addition, a large number of surplus or retired Western ships will introduce relatively new technologies to the navies of less-developed countries across the globe. Technological improvements will lead to enhanced survivability, improved sensors, and advanced weapon and combat systems in maritime aircraft and vessels through 2020.[62] Increased maneuverability, redundancy in mission critical systems and reductions in emitted signatures will also lead to more capable and survivable maritime aircraft.

b. Naval Weapon Systems

The application of expected technological advancements to naval weapon systems will yield more versatile, accurate, and enhanced defense penetration measures, leading to an overall increase in weapon lethality by 2020. Weapon systems versatility will improve through the use of multi-role weapons that can engage a host of targets, be launched from a host of platforms, and be outfitted with a number of different warhead options.

Technological advances will also lead to improvements in weapon performance. Advanced propulsion schemes for missiles and torpedoes, for example, will lead to higher average and terminal velocities of individual weapon systems, while the use of thrust vectoring and advanced materials and control systems will lead to increased maneuverability for maritime weapon systems. In addition, the widespread use of satellite navigation systems will increase the accuracy of weapon systems.[63] The eventual widespread use of multi-spectral and imaging seekers will allow for better aim-point determination and an increased ability to counter countermeasures. Enhanced defense penetration features added to missile systems will improve the ability of the projectiles to counter close-in-weapon systems. Finally, signature reduction features also will be incorporated into a variety of maritime weapons, and future missiles may even be equipped with on-board self-protection suites.

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[61] For a definition and discussion of the parameters of asymmetric warfare, see Section B1.

[62] Draft, "Advanced Technology Integrated Warfare Architecture Study: Platforms," Classified (Washington, D.C.: Office of   Naval Intelligence, November 1998), 1 and Joint Warfare Analysis Department, The Johns Hopkins University Applied Physics Laboratory, Littoral Warfare Handbook for Surface Combat System Engineering, Vol. I, Classified, March 1997, 3-55, 3-56, 3-57.

[63] Draft, "Advanced Technology Integrated Warfare Architecture Study: Naval Weapons," Classified (Washington, D.C.: Office of Naval Intelligence, November 1998), 1-7 and Joint Warfare Analysis Department, The Johns Hopkins University Applied Physics Laboratory, Littoral Warfare Handbook for Surface Combat System Engineering, Vol. I, Classified, March 1997, Chapter 3.

c. Navigation

Technological advances will influence future maritime navigation significantly by providing more accurate, reliable, and accessible information. By 2020, more vessels will be able to receive up-to-date information about water levels, currents, and obstructions. This will allow new, deeper-draft container ships to operate more efficiently and safely in U.S. ports. Mariners will rely more heavily on real-time information coupled with integrated systems to aid their navigation. Marine safety also will be improved with the pending integration of the Global Maritime Distress and Safety System (GMDSS). GMDSS will rely on a combination of satellite and terrestrial radio services to facilitate ship-to-shore communications in case of maritime emergency. GMDSS provides for automatic distress alerting and locating and, for the first time, requires ships to receive broadcasts of maritime safety information. According to the Safety of Life at Sea (SOLAS) convention, all commercial ships larger than 300 gross tons were to be fitted with GMDSS equipment by 1 February 1999.

d. Technological Impact on Asymmetric Warfare

Over the next two decades, adversaries of the United States will be more likely to engage in asymmetric warfare whereby they use "unconventional approaches to circumvent or undermine our strengths while exploiting our vulnerabilities."[64] Asymmetric warfare concepts could include terrorism; chemical, nuclear, or biological attacks; information warfare; or acts of military sabotage. The technologies that will be employed in these actions range from obsolete to state-of-the-art, and will attempt to defeat a stronger opponent on a political and/or social level without resorting to an unequal, force-on-force battle. The technologies that can be used in asymmetric warfare will be limited only by the imagination, as most technologies can be deployed in either symmetric or asymmetric ways depending upon the particular method of employment, the desired result of the employment, and the overall nature of the conflict. For example, ballistic missiles – both obsolete and advanced terminally guided systems – whether armed with high-explosive, submunition, chemical, biological, or nuclear warheads; naval mines; information warfare; and information operations tools are types of technology that could be employed against the United States in an asymmetric manner through and beyond 2020.[65]

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[64] Donald C.F. Daniel and Andrew L. Ross, "U.S. Strategic Planning and the Pivotal States," The Pivotal States, Robert Chase, Emily Hill, and Paul Kennedy, eds. (New York, NY: W. W. Norton & Co., 1999), 390.

[65] Draft, "Advanced Technology Integrated Warfare Architecture Study: Technological Impact on Asymmetric Warfare," Classified (Washington, D.C.: Office of Naval Intelligence, November 1998), 1-7 and Jeffrey B. White, "A Different Kind of Threat: Some Thoughts on Irregular Warfare," Classified, Studies in Intelligence, Central Intelligence Agency, Vol. 39, No. 5, 1996: 5.

e. Ocean Monitoring

Rapid technological growth over the next 20 years will greatly increase the use of space and earth-based remote sensing for several ocean monitoring applications. The growth of the remote sensing industry will be bounded only by its ability to attract customers willing to pay for the vast array of potential services. The space-based remote sensing industry will experience the greatest growth, in both number and capability, as more countries enter a field that was once the sole province of the U.S. and Soviet militaries. While not experiencing similar rapid growth, earth-based remote sensing systems will continue to provide detailed ocean data to maritime customers. While these advances will increase the availability of high resolution imagery data and thereby improve the efficiency and safety of maritime operations, our adversaries will have the same access to this information, which will create security and law enforcement challenges. Remote sensing, therefore, is becoming increasingly dual-use and will allow all users, both licit and illicit, to gain a wide range of ocean monitoring information. This open access to such a wide range of information will present maritime challenges to the United States.

(1) Space-based monitoring. This is an era of rapid growth for the commercial satellite imagery industry. In 1975 there was one operational commercial remote sensing satellite. In 1995 there were 12 satellites operating in orbit. By 2005 there will be 45 operational remote sensing satellites.[66] Because this industry is commercially driven, only customer demand and the ability to pay for imagery products will limit growth during the next 20 years.

(a) Electro-optical. Electro-optical (EO) sensors dominate today's satellites. These sensors are either panchromatic (black and white in the visible spectrum) or multispectral (color representation of spectral bands in the ultraviolet through infrared bands). The resolution of these sensors is expected to improve rapidly from today's best panchromatic resolution of 2 meters, available from degraded Russian military systems, to better than 1 meter resolution, from the Ikonos satellite which will be launched in June 1999.[67] Multispectral (MSI) quality is measured in spectral and spatial resolution. The LANDSAT Thematic Mapper, today's standard for MSI sensors, has seven relatively wide spectral bands and is capable of a spatial resolution of 30 meters. Future systems will be hyperspectral (HSI) and capable of discriminating in hundreds of bands with a spatial resolution of less than 5 meters.[68]

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[66] National Imagery and Mapping Agency, "Commercial Remote Sensing Satellites – Current and Planned," accessed online, URL: <http://jws.stl.nima.ic.gov/information/cst/post_conf/commi_conf/>.

[67] Air Force Research Lab, "Commercial Imaging Threat," accessed online, URL: <http://phillipslab.ic.gov/docs/ASAP2>.

[68] William F. Belokon and others, <u>Multispectral Imagery Reference Guide</u> (Fairfax, VA: LOGICON Geodynamics, Inc, 1997), 1-3.

Figure II-19. St. Petersburg, Russia: 5-Meter Imagery from the Indian Remote Sensing Satellite's Pan Sensor.[69]

Hyperspectral sensors (which are also EO) will revolutionize the concept of imagery. In essence, HSI sensors detect the spectral signature of an object's component materials—not necessarily a spatial image. HSI represents a fundamental shift in comprehension over the current MSI sensors by a factor of 10. Whereas MSI sensors can break the spectrum into several wide bands, HSI will vastly expand the capability to examine hundreds of discrete and narrow spectral bands. In addition, future HSI sensors will expand the sensed spectrum far into the short-wave infrared segment. These measurements of an object's spectral reflectance allow minute differences, which are not visually discernible, to be analyzed and can provide much fuller understanding of activity in an area of interest.[70] The first true HSI system, the Orbview-4, is scheduled to be launched in 2001 by the U.S.-based Orbital Sciences Corporation. Once the technology is fielded, other countries, which are well aware of the value to be gained from HSI, can be expected to follow suit.[71]

(b) Synthetic Aperture Radar (SAR). As good as EO systems are at providing high-resolution imagery of points on earth, they are unable to see through clouds. SAR, however, can provide all-weather remote sensing capability. Commercial SAR systems are improving as rapidly as the EO systems. Canada's RADARSAT system, launched in

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[69] Space Imaging, Inc, accessed online, URL: <http://www.spaceimaging.com/home/gallery/index.html>.

[70] William F. Belokon and others, Multispectral Imagery Reference Guide (Fairfax, VA: LOGICON Geodynamics, Inc, 1997), 7-1 – 7-8

[71] McMunn Associates and Tera Research Inc., Handbook of Unmanned Civilian Imaging Satellites (Washington, D.C.: Office of Naval Intelligence, 14 October 1998), 4.

1995 became the standard for performance in commercial SAR systems. It provided, for the first time, widely available 7.5-meter resolution. Future systems are expected to have better than 3-meter resolution.[72]

Space-based SAR sensors will provide a unique capability to monitor relatively large ocean areas for suspect activity. In particular, RADARSAT has a proven capability to detect ships in an ocean surveillance mode.[73] It also has been effective at detecting "go-fast" boats smuggling drugs. This is the first time that a commercial space-based system has demonstrated a capability in what until now has been a military bastion: open ocean surveillance.[74]

(c) Satellite Technology. Emerging SMALLSAT technology is largely responsible for the exponential growth in the commercial satellite industry. This technology incorporates miniaturized electronic components, lightweight structure, and "assembly-line" manufacture techniques.[75] SMALLSAT technology is capable of producing EO resolutions of better than 1 meter at a fraction of previous development costs and allows the development of commercial "turn-key" reconnaissance systems. Most important, SMALLSAT technology makes deploying a constellation of remote sensing satellites commercially viable. Such a constellation, comprising four or more satellites, will also overcome one of today's obstacles to wider tactical use of space-based remote sensing. Current constellations, comprising one or two satellites, are limited in their capability to frequently revisit points of interest on earth. As an example, in higher resolution modes, a single satellite will only revisit a point on earth every 20 or so days.[76] Further, many of these constellations will feature satellites with multiple sensors such as MSI and SAR. The synergy of such a system will allow greater understanding of the activity and characteristics in an area of interest.[77]

SAR systems are also on the brink of revolutionary advances. The same technology that is responsible for the boom in EO suites is also responsible for the construction of LIGHTSARs—SAR satellites that are orders of magnitude cheaper to build.[78] The technology is available today to build and deploy a cost-effective SAR satellite that is capable of providing data at better than 1 meter resolution. The only obstacle to deploying such systems is U.S. Government policy that restricts U.S. companies to marketing only 5-meter data to non-U.S. Government customers. However, by 2002, Canada's

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[72] Air Force Research Lab, "Commercial Imaging Threat," accessed online, URL: <http://phillipslab.ic.gov/docs/ASAP2>.

[73] M. D. Henschel and others, Comparison of Probability Statistics for Automated Ship Detection in SAR Imagery, (Halifax, Nova Scotia, Canada: SATLANTIC INC., July 1998), 6.

[74] RADARSAT International, Ship Detection and Monitoring Using RADARSAT, brief, 1996.

[75] SMALLSAT Conference. Logon, UT, September 1996.

[76] KPMG Peat Marwick LLP, The Satellite Remote Sensing Industry: A Global Review, (Washington, D.C.: KPMG, 1998), 20-30.

[77] Office of Naval Intelligence, Commercial Imagery Trends, brief, 1996.

[78] Jet Propulsion Laboratory, LIGHTSAR (Pasadena, CA: Jet Propulsion Laboratory, 1996).

RADARSAT is expected to provide SAR data of at least 3-meter resolution. Other countries, such as France, Germany, India, and Japan, would be able to quickly equal this capability.[79]
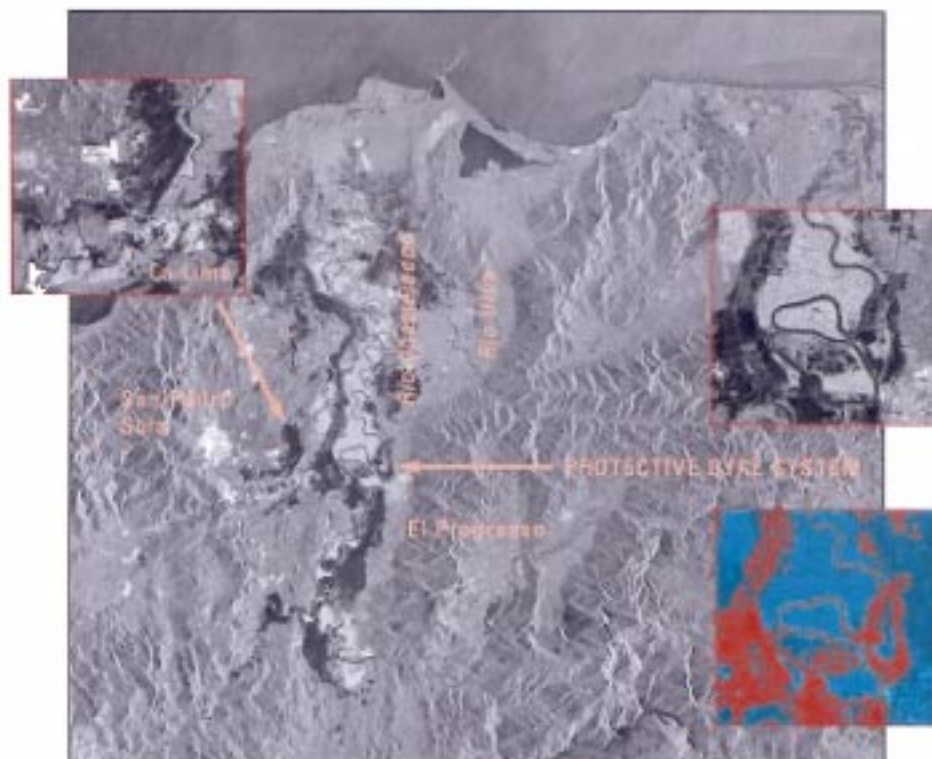

Figure II-20. RADARSAT Image of Honduras after Hurricane Mitch.[80]

Improvements in SAR designs, such as the LIGHTSAR concept, will encourage a proliferation of SAR satellites. Although they will be smaller and cheaper, future SAR satellites will have the same capabilities as the larger models, either on a single vehicle or divided among a number of satellites. These capabilities will include multiband, multipolarization, and electronic beam steering for variable swath width and resolution. The synergy of these capabilities, especially when fused with EO data, will provide far more knowledge of an area of interest.[81]

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[79] Jet Propulsion Laboratory, Operational Use of Civil Space-Based Synthetic Aperture Radar (SAR), JPL Publication 96-16, (Pasadena, CA: Jet Propulsion Laboratory, 21 August 1996), 3-1 – 4-2.

[80] Radarsat International, accessed online, URL: <http://www.rsi.ca>.

[81] Jet Propulsion Laboratory, Operational Use of Civil Space-Based Synthetic Aperture Radar (SAR), JPL Publication 96-16, (Pasadena, CA: Jet Propulsion Laboratory, 21 August 1996), 3-1 – 4-2.

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The following table illustrates current and projected space-based remote sensing capabilities.[82]

SYSTEM	NOW	2020
ELECTRO-OPTICAL		
NUMBER	10-11	30
RESOLUTION	2 METER	< 1 METER
SPECTRUM	MULTISPECTRAL (5-7 BANDS)	HYPERSPECTRAL (250 BANDS)
SYNTHETIC APERATURE RADAR (SAR)		
NUMBER	3	6
RESOLUTION	7.5 METER	1-3 METER
BAND NUMBER	SINGLE	MULTIPLE
POLARIZATION	SINGLE	MULTIPLE
GENERAL SYSTEM CHARACTERISTICS		
TIMELINESS	HOURS	MINUTES
OWNERSHIP	NATIONAL	MUTINATIONAL

Table II-5. Future Commercial Satellite Capabilities.

The amount of information that can be gained from space-based remote sensing systems will greatly improve the execution of many maritime activities such as the following:

• <u>Safe Navigation</u> – Real or near-real time satellite data could supply mariners with information about a surrounding area. One application of this information could be detection of nearby ships for safety of navigation. Information gathered on wind, wave, and current conditions could also be used for safe navigation or maintaining station.

• <u>Ship Detection</u> – Port vessel traffic systems, which currently use earth-based sensors, could benefit from real or near-real time satellite imagery to safely direct harbor traffic. Overhead imagery would provide the big picture of the harbor and supply an additional source of information for efficient vessel traffic management.

• <u>Fisheries</u> – Commercial satellites could provide fishing fleets with data to target potential fishing areas. These satellites would identify large masses of phytoplankton, which are likely feeding grounds for fish. Surface temperature measurements also could help fishermen target migratory species such as tuna, salmon, and shark. Remote sensing already is beginning to affect fisheries activities. "The UN Food Agriculture Organization (FAO) is developing a GIS [Geographic Information System] system that includes remote sensing data for use in world ocean fisheries. FAO is using remote sensing data to detect both physical and human resources related to marine fisheries and baseline inventory and coastal monitoring."[83]

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[82] McMunn Associates and Tera Research Inc., <u>Handbook of Unmanned Civilian Imaging Satellites</u> (Washington, D.C.: Office of Naval Intelligence, 14 October 1998), 3-4.
[83] KPMG Peat Marwick LLP, Space and High Technology Practice, <u>The Satellite Remote Sensing Industry: A Global Review</u>, (Washington, D.C.: KPMG Peat Warwick LLP, 1998), 45.

- Ocean Routing – Using satellite information, shipping companies can route vessels around dangerous weather or other potentially harmful conditions. Remote sensing data is already being used to detect ice in the Arctic, Antarctic, Great Lakes, and Chesapeake Bay. As a result, ocean routing can improve safety for the ship, cargo, and crew as well as save time and money.

- Aquaculture – Remote sensing data could be used to monitor the water quality where fish are being commercially grown. In the event polluted waters are detected, authorities could prevent the sale of contaminated fish.

- Search and Rescue - A wide variety of remote sensing applications could be applied to vessels in distress. Technology could furnish satellite imagery to search large open ocean areas. In addition, satellite information could provide authorities with important data for operational rescues. Weather conditions on scene including wind, waves, currents, and water temperature are some examples of valuable data.

- Environmental Protection - Remote sensing can detect oil spills and help track spill movement, particularly with respect to large spills. During clean-up operations, remote sensing data could track progress as well as provide important weather conditions to help predict the movement of an oil spill. Furthermore, satellite imagery could possibly identify vessels suspected of dumping pollutants into the ocean.

- Law enforcement – Commercial remote sensing could aid law enforcement agencies by providing quick and cost effective solutions to area surveillance limitations. There is a wide range of potential applications for remote sensing in the law enforcement community. These include fisheries enforcement, drug smuggling interdictions, immigration detection, and maritime boundary enforcement.[84]

The challenges posed by the availability of increasingly sophisticated imaging systems, if anything, will grow. While the information gained from remote sensing will greatly increase knowledge of the maritime environment for peaceful purposes, U.S. adversaries, who will have access to this same information, will be able to apply this knowledge to exploiting gaps in law enforcement operations, or monitoring military presence or operations. Regardless of U.S. policy, the world market is quickly developing high resolution, information dense imagery. This trend can be expected to continue as commercial—rather than military—demand develops.

Although most threat analysis for adversary use of commercial satellite imagery has been focused on military operations, there are similar threats to other maritime operations. The principal threat is disclosure of operating positions, forces, and movements.

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[84] Gordon Campbell and Brian Whitehouse, "Satellite Surveillance for Civilians," <u>Backscatter</u>, Vol. 9, No. 1 (February 1998):15.

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In 1989, the Carnegie Endowment for International Peace studied the threat posed by commercial satellite imagery. Carnegie researchers tested the French SPOT company's Open Skies sales policy under the premise that if SPOT sold imagery of sensitive areas in its own country, it would probably sell imagery of other states without restriction. Using SPOT imagery of French territory, Carnegie's lead researcher, Dr. Bhupendra Jasani, identified controlling headquarters, security fences, perimeter roads, and 18 probable launch silos. Dr. Jasani was convinced that even 10-meter data is usable in intelligence. With 1-meter resolution data, the applications increase exponentially.[85]

Figure II-21. Six meter NOAA weather buoy.

Groups involved in criminal activities, such as smuggling and poaching, also would benefit through unrestricted access to high-resolution commercial satellite imagery. For example, "front companies" for organized crime groups could buy commercial satellite imagery to locate law enforcement assets at sea to help avoid interdiction of illicit cargo. The revolution in remote sensing will also greatly improve the ability of distant water fishing fleets to pinpoint the location of high value fish stocks, making it easy for them to quickly harvest fish stock and depart the area before enforcement assets.

(2) Earth-based. Although the most significant growth will occur in the space-based systems, the need for earth-based sensors will not diminish. These sensors will provide accurate data, which will calibrate and validate information derived from satellites. These sensors also will provide real time information to aid mariners and improve safety on the waterways.

Over the next 20 years, mariners will continue to rely on important data such as current and weather information to navigate the oceans and harbors safely. Although such data traditionally have been recorded in tables and books that are regularly updated, technological advances have enabled mariners to obtain near real-time data directly. Weather buoys such as the one shown here are maintained by the National Oceanographic

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[85] Central Intelligence Agency, "Verification Implications of Commercial Satellite Imagery," unpublished research paper for Central Intelligence Agency, accessed on Intelink.

and Atmospheric Administration (NOAA) and provide localized data. Weather buoys will continue to provide valuable information to mariners and weather forecasters relying on real-time data. Members of the NOAA's National Data Buoy Center (NDBC) who currently manage roughly 70 weather buoys predict that the number of buoys will at least stay the same and could possibly double by 2020.[86] In addition to the weather buoys, NOAA also partially manages and operates the Physical Oceanographic Real Time System (PORTS) which is an information acquisition and dissemination technology. PORTS includes the integration of real-time currents, water levels, winds, and water temperatures at multiple locations within the port. The information is disseminated through a telephone voice response system, a direct dial-up using a modem, and via the internet. The PORTS program currently is active in four ports and is an example of the type of systems and information that mariners will depend on in the future in order to safely navigate U.S. waters.

There also is a growing demand for scientific measurements to help study the oceans. Several representatives from organizations such as NOAA, the National Science Foundation, Scripps Institute of Oceanography, and the Woods Hole Oceanographic Institution testified before Congress in July 1998 on the status of oceanographic monitoring and assessment efforts on both the global and local scales. Dr. Fred Grassle, Director of the Institute of Marine and Coastal Sciences, commented, "Efficient, safe, sea transportation is a requirement for the economic success of our ports and coastal economies. We need better prediction of coastal hazards including storms, coastal erosion events, harmful algal blooms, and oil spills, or even when and where to spend a pleasant day fishing or swimming."[87] The growing market for timely, accurate ocean information will certainly lead to an increase in both earth-and space-based sensors during the next 20 years, bringing both tremendous benefits and challenges to those responsible for maintaining safety and security on the sea.

5. Information Operations

With the growing availability of vital information in electronic form, accessible through the Internet or private computer networks, the future security threat to information and technology infrastructures will increase exponentially. Despite efforts to construct firewalls and secure networks, vital military and economic data will be more vulnerable than ever to attacks by individual hackers and organized sabotage operations. Information warfare will increase by 2020; the dependence of the United States on information networks makes it especially vulnerable to information attack. Although the United States is strategically placed to benefit from, and perhaps even continue to dominate,

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[86] Interview with Mr. Erik Meindle and Mr. Doug Scally, National Data Buoy Center, interview with author, August 1998.

[87] Congressional Quarterly Inc., "House Resources Hearing: Ocean Observation Systems," U.S. Congress, Subcommittee on Fisheries Conservation, Wildlife and Oceans, accessed online.

information technologies, the ability of the United States to operate without fear of attacks against its information infrastructure will erode as other states choose information over industry as an instrument of national power.[88]

Key functions of maritime operations, such as navigation, communications, and maritime surveillance, have always had a significant information component. The information revolution has only intensified that characteristic. The obvious dependence of maritime security and law enforcement on information makes the information itself a high-payoff target for adversaries, whether state-sponsored or not.

Figure II-22. Attacks against the U.S. information infrastructure could potentially disrupt maritime operations.

Although maritime law enforcement information systems tend to have a lower profile than national security systems as prestigious targets for amateur hackers, the consequences of even prank hacking are unacceptable. At the same time, the availability of sophisticated but affordable sensor and communications systems will enhance the capabilities of smugglers, illegal fishermen, terrorists, foreign special operations forces, dumpers of environmentally hazardous materials, pirates, and others.

The U.S. DOD plans to harden all national defense information systems, including those used at sea, to keep out casual intruders and to limit the damage even successful intruders can inflict. Actions taken to increase information security will clear the information battlefield for the contest against opponents who have the most resources and skill. The future field of conflict, however, will not be confined to computer networks, but will include all aspects of information security: personnel security (including awareness of and resistance to human intelligence operations), operational security, signals security, counter-deception, public affairs/media policy, etc. Adversaries can be expected to employ a multi-disciplinary approach to acquiring foreknowledge of maritime operations, which must be matched by a full-spectrum information security plan. As U.S. maritime surveillance in the coastal zone becomes more sophisticated and comprehensive, adversaries may attack that system through its own sensors, providing multiple credible false targets to

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[88] Joint Chiefs of Staff, Joint Pub 3-13, *Joint Doctrine for Information Operations*. (Washington, D.C.: GPO, 9 October 1998), III-1.

diffuse coastal patrol efforts. The legitimacy and efficacy of U.S. maritime security operations may even be called into question by adversary-funded media campaigns, requiring a "counter-punch" public affairs stance.

Since U.S. civil infrastructure also has a heavy information component, those attacking maritime infrastructure facilities—including port facilities, bridges, navigation aids, and shipping— have the option of using information-based means.[89] Infrastructure attacks may be perpetrated not only by non-state groups and individual hackers, but by foreign countries as part of an asymmetrical strategy for confronting the United States. In brief, U.S. dominance in high-technology conventional expeditionary warfare may motivate non-state adversaries and foreign countries to carry the conflict to U.S. territory, over the heads of deployed forces, with at least two objectives:

> • to visit the consequences of activist U.S. foreign policy on the electorate, possibly preventing the formation of a national consensus for that policy, and

> • to interfere with military force generation, deployment and sustainment from U.S. bases.[90]

Given the unquestionable superiority of American military might, foreign states, should they choose to attack the United States, are likely to use unconventional strategies, such as weapons of mass destruction, terrorism, and information warfare. In addition, "[n]on-state actors, such as international crime rings, terrorist organizations, separatist groups, and cults, can acquire IW weapons or hire IW warriors. Compared to the acts of clumsy governments, their attacks could be hard to trace, punish and deter."[91]

6. Law of the Sea

The 1982 United Nations Convention on the Law of the Sea (UNCLOS) will remain the guiding global authority on maritime activities through 2020. The UNCLOS regime will be strengthened by an increase in the number of states that ratify or accede to UNCLOS and by the negotiation of corollary agreements consistent with UNCLOS. The law of the sea, designed to be upheld and executed through additional maritime conventions, will continue to be tailored to address and resolve global and regional issues through the development of global, regional, or bilateral treaties. The UNCLOS regime will not undergo any great or fundamental changes over the next 20 years and

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[89] Presidential Decision Directive (PDD) 63. "Protecting America's Critical Infrastructures." 22 May 1998. Critical Infrastructure Assurance Office, accessed online, URL: <://www.ciao.gov/63factsheet.html>.

[90] V.K., Nair, Brig., VSM (ret.) War in the Gulf: Lessons for Third World Nations (New Delhi, India: Lancer International, 1991).

[91] David Gompert, "National Security in the Information Age." Naval War College Review. Vol. LI, No. 4, Seq. 364. (Autumn 1998): 33.

there is little chance that present state members will withdraw from the Convention or challenge its fundamental provisions.[92,93]

UNCLOS entered into force in November 1994, 1 year after the 60th state deposited an instrument of ratification or accession.[94] One hundred and thirty states are now party to UNCLOS, which codified the extent of offshore jurisdiction that states could exercise, establishing the following:

- a 12-nautical-mile territorial sea
- an additional 12-nautical-mile contiguous zone for customs, fiscal, immigration and sanitary regulation
- an Exclusive Economic Zone (EEZ) of 200 miles
- coastal state jurisdiction over the continental shelf, including where the continental shelf extends beyond the limits of the EEZ.[95] (See Figure II-23)
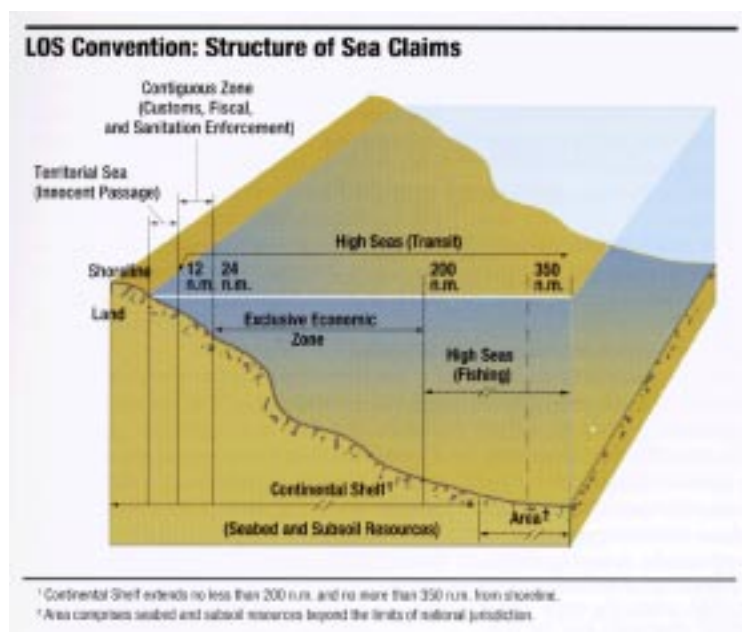

Figure II-23. LOS Convention: Structure of Sea Claims.[96]

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[92] Interview with Dr. Christopher Joyner, Professor of Government at Georgetown University,   interview with author, 26 January 1999.

[93] Interview with J. Ashley Roach, Capt. USN (ret.), Legal Advisor at Department of State, interview with author, 4 February 1999.

[94] The four occasions when the international community has come together to codify public international maritime law are 1) The Hague Conference for the Codification of International Law in 1930, 2) the 1958 Geneva Convention on the Law of the Sea, 3) the 2nd U.N. Convention on the Law of the Sea in 1960, and 4) the 3rd U.N. Convention on the Law of the Sea, 1973-1982.

[95] Hans A. Binnenddijk and Patrick L. Clawson, eds., Strategic Assessment 1995: U.S. Security Challenges in Transition (Washington, D.C.: National Defense University Press, 1995), 110

[96] Hans A. Binnenddijk and Patrick L. Clawson, eds., Strategic Assessment 1995: U.S. Security Challenges in Transition (Washington, D.C.: National Defense University Press, 1995), 111.

UNCLOS also guarantees the preservation of the rights of maritime custom, such as freedom of navigation and innocent passage, and outlines a regime for fisheries, pollution, and marine scientific research in the maritime environment. (See Figure II-10.)

Law of the Sea Terminology

Territorial Sea: Territorial sea extends seaward from the baseline up to a limit not exceeding 12 nautical miles.

Innocent Passage: Maritime passage is innocent if it does not violate the peace or good order or security of the coastal state.

Contiguous Zone: The sea area adjacent to the territorial sea and having, together with it, a width of no more than 24 miles within which the coastal state may exercise control in certain, specifically designated subjects.

Exclusive Economic Zone (EEZ): An area seaward of the territorial seas up to 200 miles wide within which coastal states exercise exclusive jurisdiction over economic activities subject to a regime based on freedom of the high seas.

Continental Shelf: The continental shelf of a coastal state comprises the seabed and subsoil extending beyond the territorial sea throughout the natural prolongation of the coastal state's land territory up to the outer edge of the continental margin or to a distance of 200 nautical miles, or more in certain cases.

As marine pollution and the competition for living and non-living marine resources increases, coastal states may threaten to extend enforcement beyond areas of national jurisdiction (i.e., their territorial waters, contiguous zones, and EEZs).[97] Such an increase in the exercise of coastal state jurisdiction may impinge on traditional maritime rights (such as freedom of navigation) and could conceivably affect the movements and operations of maritime law enforcement services or military forces. More active or extended coastal state law enforcement capabilities, however, could also hamper commercial shipping activities, especially in cases where flag states fail to enforce fishing and/or pollution regulations.[98] For example, some coastal states, including the United States, may try to enforce environmental controls by regulating commercial activities within their EEZs in ways that the convention does not specifically mandate.[99] The United States is also one of a small group of coastal states with the capability and the incentive to institute more stringent enforcement of UNCLOS fishery agreements on vessels flying the flag of other countries on the high seas. In the same vein, the pressure of increased marine pollution and its effect on national fisheries may prompt coastal states to engage in extra-territorial enforcement to protect their national marine resources. For example, in 1995 the Canadian Department of Fisheries and Oceans seized a Spanish trawler that was fishing in the North Atlantic Fisheries Organization (NAFO) regulatory area in violation of the NAFO catch restriction on Greenland halibut (turbot). Similar activities are projected to occur more frequently as competition for marine resources intensifies.

[97, 98] Interview with J. Ashley Roach, Capt. USN (ret.), Legal Advisor at Department of State, interview with author, 4 February 1999.

[99] Interview with Dave Balton, Director of the Office of Marine Conservation at Department of State, interview with author, 4 February 1999.

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While the future of deep seabed mining is hard to predict, any growth in the seabed mining industry will occur within the UNCLOS framework and the state or non-state actors undertaking the activity will have to act within that international legal regime. UNCLOS established the International Sea-Bed Authority (ISBA) to govern seabed mining. ISBA is charged to organize and oversee the exploitation of mineral resources of the deep seabed and to assure that both developed and developing states benefit from seabed mining.[100] While UNCLOS outlines the framework for the conduct of seabed mining and the system of profit-sharing between developed and developing nations, deep seabed mining has been stymied by the discovery of significant mineral stores on land, prohibitively expensive seabed mining technologies, and a weak demand for the minerals that can be harvested from the sea.[101]

Although the United States has not acceded to UNCLOS, all three administrations since 1984 have accepted and pledged to act in accordance with the Convention. The United States did participate in the creation of the ISBA, but its provisional membership in that body expired in 1998. It is likely, however, that the United States will accede to UNCLOS within the next 20 years.

B. DESTABILIZING EVENTS.

The types of events that undoubtedly will occur through 2020, and which will either cause or exacerbate instability, include the broad spectrum of warfare, from asymmetric through large-scale regional, catastrophic natural disasters, and humanitarian emergencies. In addition to being destabilizing, any of these types of events could have a profound impact on maritime security. That some or all of these types of events will occur over the next two decades is predictable; the what, where, when, and how is speculation.

1. Political-Military Engagements

While the likelihood of global or nuclear war is improbable through 2020, there will be a high incidence of smaller conflicts and the steady continuation of lower order military threats. The international environment of 2020 will "very likely be one where world economic competition and tensions will be high and where armed conflict remains a possibility."[102] Competition over resources, territory, and regional dominance between nations and among peoples within and across nations will be prevalent, often erupting into conflict. Civil wars and violent clashes between ethnic and religious groups will

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[100] National Intelligence Council, <u>Law of the Sea: The End Game</u> (Washington, D.C.: National Intelligence Council, March 1996), 15, 19.

[101] See Chapter III, Section Ab(1) for a discussion on Ocean Minerals.

[102] Charles W. Taylor, <u>A World 2020 : A New Order of Nations</u> (Carlisle, PA: U.S. Army War College, 1992), 11-12.

occur as states established by imperial or colonial powers in the 19th and 20th centuries, but lacking a unifying sense of nationhood among their inhabitants, are challenged by other group identities. Irregular warfare, including terrorism, insurgency, ethnic conflict, guerilla warfare, low-intensity conflict, and inter/intra-tribal warfare, will challenge stability within countries—and occasionally within regions—across the globe. [103] Most of the antagonists of these conflicts will seek to target the political will of stronger adversaries via asymmetric means, rather than directly challenging their military might, and thereby may target both civilian and military sectors of society.[104]

Perhaps the most likely challenges to be faced by maritime forces through and beyond 2020 will be found in a variety of asymmetric warfare options. Given that only a handful of countries have the capability to project naval power outside their own geographic region, and that the vast majority are unable to project power beyond their own territorial waters, it is highly unlikely that any foreign naval power will emerge by 2020 which will be capable of challenging U.S. maritime superiority on a global basis. Rather, the vast majority of future maritime challenges will originate from individual states and stateless organizations with naval capabilities ranging from the nonexistent to a limited ability to operate within their own territorial waters. In order to defeat their adversaries, such countries and organizations will only be able to achieve success against modern Western maritime forces through the use of asymmetric warfare.[105]

Most conventional military operations endorse the elementary goal of asymmetric warfare. However, asymmetric warfare connotes actions by the weaker power which are unexpected, unusual, or surprising from the viewpoint of the stronger adversary. Asymmetric warfare can also involve actions launched by an inferior power against a superior power which the latter has a difficult time countering for political reasons or force structure issues, or which pursue ends that constitute a different definition of victory for the inferior power than the stronger power. In many cases, asymmetric warfare will express itself in the form of tactical battlefield measures taken by a foreign country or stateless organization to win a limited set of political objectives during a confrontation with the United States.[106]

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[103] LITTON-TASC, Problem Identification and Definition Forecast 2020 (U) (Chantilly, VA: LITTON-TASC, Inc., 1998), 19.
[104] Joint Warfare Analysis Department, The Johns Hopkins University Applied Physics Laboratory, Littoral Warfare Handbook for Surface Combat System Engineering, Classified, Vol. I, March 1997, Chapter 1.
[105] Draft, "Advanced Technology Integrated Warfare Architecture Study: Technological Impact on Asymmetric Warfare," Classified (Washington, D.C.: Office of Naval Intelligence, November 1998), 1.
[106] Michael Mendenhall, "Challenges in the Littoral: 2010," Classified, ONI Brief, May 1998 and Curt Smith, "Asymmetric Warfare: Future Warfare in the Littorals?," Classified (Washington, D.C.: U.S. Marine Corps Intelligence Activity, July 1998), 1-5 and 8-13.

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Asymmetric warfare concepts vary widely, and many types of warfare could be used asymmetrically. According to the National Defense University's Institute for National Strategic Studies, there are four broad asymmetric warfare options to combat foreseeable U.S. military superiority:

• Acquiring weapons of mass destruction (WMD) and long-range ballistic or cruise missiles.

• Acquiring high-technology sensors, communications, and weapon systems.

• Exploiting cyberweapons to disrupt military logistics systems or the U.S. national strategic infrastructure.

• Engaging the U.S. in environments that degrade U.S. ability to attack militarily significant targets. (For example, choosing to fight in urban areas, or purposely blurring the distinctions between actions considered crimes and those viewed as warfare).[107]

In addition, small boat tactics, guerrilla warfare, terrorist activities, and the exploitation of media coverage of events are other possible asymmetric options. Regardless of the options employed, the asymmetric challenger, "unable or unwilling to confront U.S. military power directly, and in kind, will pursue asymmetrical advantages designed to negate the U.S. military's comparative advantages."[108] Accordingly, the challenger will subscribe to an overall strategy that links political and military objectives in a manner that thwarts any U.S. and allied hopes of a quick, surgical victory. The challenger may even try to inflict a level of damage on U.S. forces and facilities that will weaken U.S. resolve for a protracted war, avoiding a direct confrontation with superior U.S. military power and instead concentrating on inflicting unacceptably high levels of damage and casualties by exploiting U.S. vulnerabilities.[109]

Through 2020, the world's littorals will present the most challenging environment for operations by maritime forces. In coastal areas, both long- and short-ranged, land-based systems, as well as maritime forces ranging from those with open-ocean capabilities to those tied closely to the shore, can be brought to bear on U.S. maritime forces. Challenges in the littoral therefore include a greater variety and number of weapons and delivery means that can be brought to bear on naval forces than in any other maritime

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[107] Hans A. Binnenddijk and David C. Gompert, eds., <u>Strategic Assessment 1998: Engaging Power for Peace</u> (Washington, D.C.: National Defense University Press, 1998), 170-171.

[108] William Rosenau, Gay Kemper, and David Mussington, "Transnational Threats and U.S. National Security," <u>Low Intensity Conflict and Law Enforcement</u>, 6 (1997) : 152.

[109] Draft, "Power Projection Integrated Warfare Architecture Study: Littoral/Expeditionary Warfare Challenges," Classified (Washington, D.C.: Office of Naval Intelligence, November 1998),1 and Jeffrey B. White, "A Different Kind of Threat: Some Thoughts on Irregular Warfare," Classified, <u>Studies in Intelligence</u>, Central Intelligence Agency, Vol. 39, No. 5, 1996: 5.

environment. Moreover, with the continually increasing range and accuracy of offensive stand-off weapons, the distinction previously made between the mere projection of offensive naval power will become blurred. Defending their national territories and territorial waters against these new, long-range strike weapons will require countries to project power to distances where these weapons can be neutralized. Therefore, those few states with any capability to do so will seek to deny the United States the sea area necessary to conduct long-range strike operations, while the rest will seek at least to oppose those U.S. forces that must operate closer to shore.[110]

Future conventional maritime weaponry that could present challenges in the littoral include aircraft, antiship cruise missiles (ASCMs), patrol combatants and larger naval surface combatants, submarines, mines, special operations forces, small craft, coastal artillery, ballistic missiles (including terminally guided missiles), and even weapons available to ground combat units operating along the shoreline. Other non-conventional weapons, including biological and chemical weapons, could also be encountered. Many military operations in times of tension short of war–during sanctions enforcement, non-combatant evacuations or shipping escort operations, for example–could take place very near the bases and routine operating areas of potentially hostile foreign forces, allowing them to attack with little warning at a time and place of their choosing, and in waters well known to them.[111]

Control of the littoral battlespace of the future will be won by those forces that best combine surveillance, strike, and support capabilities. In many countries, improvement in littoral surveillance capabilities will be driven by a need to patrol exclusive economic zones and enforce sovereignty in them. In a few cases, an additional imperative will exist to monitor and target hostile forces approaching or operating within stand-off weapon range of the country's coast. Surveillance and targeting technology is becoming more complex and capable, with space surveillance systems expected gradually to assume a more important role in reconnaissance and target cueing.[112]

Whether during conflicts or in operations other than war, the world's littorals will be the most stressing environment for U.S. maritime forces through 2020. The greatest variety of foreign capabilities come together in the littoral, and those capabilities will continue to grow; what are now new technologies largely limited to the industrialized world will become increasingly available for purchase and/or production by 2020. Many countries

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[110] Draft, "Power Projection Integrated Warfare Architecture Study: Littoral/Expeditionary Warfare Challenges," Classified (Washington, D.C.: Office of Naval Intelligence, November 1998) and Jeffrey B. White, "A Different Kind of Threat: Some Thoughts on Irregular Warfare," Classified, Studies in Intelligence, Central Intelligence Agency, Vol. 39, No. 5, 1996:5.

[111] Office of Naval Intelligence, Worldwide Threat to U.S. Navy and Marine Forces, 1997-2017, Vol.1, Classified (Washington, D.C.: Office of Naval Intelligence, October 1997), 7.

[112] Michael Mendenhall, "Challenges in the Littoral: 2010," Classified, ONI Brief, May 1998.

will have examined the problems of countering U.S. naval operations near their shores and may have developed asymmetric strategies and tactics with which to attempt to deny a quick victory to the United States. Denying an asymmetric challenger the ability to drag out a war on his terms, perhaps in water near his bases and far from one's own, may pose the greatest littoral challenge of all in 2020.[113]
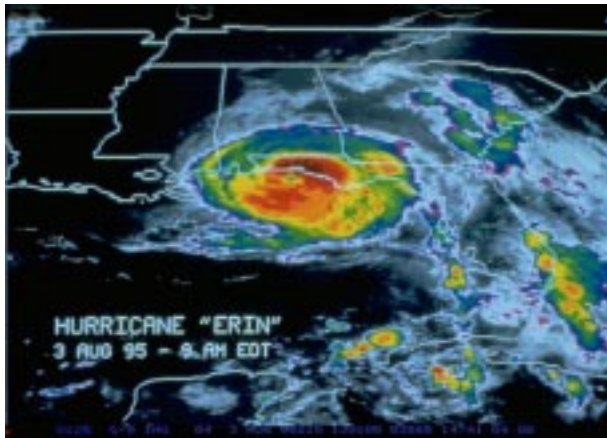
2. Natural Disasters

Figure II-24. NOAA Satellite imagery of hurricane Erin in August 1995.

Littorals frequently are subjected to natural disasters including, but not limited to, hurricanes, typhoons, cyclones, floods, and tsunamis. Using data on "notable" natural disasters that have occurred since 1950, it is possible to identify those regions that are highly vulnerable to natural disasters and those regions that incur the greatest number of deaths and collateral damage from natural disasters.[114]

Hurricanes (as they are called in the Atlantic, Caribbean, Gulf of Mexico, and eastern Pacific), typhoons (as they are known in the western Pacific), and cyclones (as they are called in the Indian Ocean) are all the same type of severe tropical storm. The United States, the Caribbean, and Central America are the regions most likely to be hit by hurricanes and major tropical storms. Of these regions, the Caribbean and Central America suffer the greatest amount of damage and human casualties. The Philippine Islands, Japan, and China are the three areas most affected by typhoons, with the Philippines incurring the highest rates of death and collateral damage. Finally, Bangladesh is the country that is subjected to the highest rate of death and damage from cyclones, severe rainstorms, and floods. Over the past 50 years, more than 540,000 Bangladeshis have died in nine major storms.[115]

Since 1950, the United States and Europe have had the largest number of notable floods; however, these floods have not caused the extent of damage and death seen in other parts of the world. For example, Bangladesh, China, India, Pakistan, and South America have incurred significantly greater human and property losses from fewer floods.

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[113] ibid.

[114] The term "notable" is taken directly from The World Almanac and Book of Facts 1998, the source of the historical data used in this section.

[115] Robert Famighetti, ed., The World Almanac and Book of Facts 1998 (Mahwah, New Jersey: K-III Reference Corporation, 1997), 268-270.

CHALLENGES TO MARITIME SECURITY

Based on data from notable natural disasters since 1950, there have been an average of eight hurricanes, four typhoons, two cyclones, and fourteen floods each decade that have caused a significant loss of life and/or major property damage. As discussed in Chapter I, there are no significant changes expected in the global climate through 2020 and, although the number and or severity of major storms can vary widely from one year to the next, the data gives an indication of the number of storms possible over that timeframe.

Figure II-25. Hurricanes will continue to batter the U.S. coastline in the years ahead.

A product of earthquakes, volcanic eruptions, and underwater landslides, tsunamis cannot be predicted in terms of frequency or severity. However, the destructive force of a tsunami is such that even a relatively small one can cause great loss of life and damage if it strikes an inhabited coastline, particularly when little warning is available. Tsunamis occur with fair regularity, especially in the Pacific, and have affected U.S. territory including Alaska, Hawaii, and the Pacific Northwest.

3. Other Emergencies

In addition to the threats posed by potential natural disasters and possible political-military engagements, the marine environment may also experience man-made disasters, epidemics, or mass migrations. Through 2020, "accidents involving nuclear power generators, chemical production, toxic waste disposal, or sudden and intense pollution of the water supply all appear to be well within the realm of possibility."[116] In addition, the outbreak of contagious disease or a massive flow of migrants or refugees would threaten security in the littorals. The occurrence of any of these events would jeopardize a large number of people and would necessitate an immediate humanitarian response. Accordingly, governmental and non-governmental humanitarian relief organizations can expect to be called upon repeatedly to assist in organizing and distributing food, water and medical supplies, providing transportation and evacuation assistance, assessing the loss of life and the extent of casualties, and constructing temporary shelters and emergency infrastructure.

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[116] Defense Intelligence Agency, <u>Alternate Futures in International Security Affairs, 2015: A Summary Study of the "Transformed World, 2015" Project</u> (Washington, D.C.: Defense Intelligence Agency, 1997). 4.